

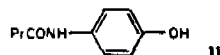
and 3 phr III had scorch time (time required to increase Mooney viscosity by 5) 73 min 22 sec at 130°, compared with 36 min 30 sec. for I contg. 2 phr II; cables sheathed with the above compns. showed similar insulation properties.

140967k Homogeneous grafting polymers of vinyl chloride. Vay et Cie. Belg. 772,261 07 Mar 1972, Appl. 772,261, 07 Sep 1971; 13 pp. Vinyl chloride (I) [75-01-4] was grafted with elastomers to give PVC-based products with improved shock resistance. High yields of graft polymers of polyethylene [9002-88-4], polypropylene [9003-07-0], ethylene-propylene polymer [9010-79-1], and ethylene-propylene-nonconjugated diene copolymer were prepd. independently of the mol. wt. of the elastomer used. The degree of grafting was independent of elastomer mol. wt.

140968m Crosslinking polyolefins. Kagiya, Tsutomu; Mitsui, Akira; Tsuneda, Kazuyoshi; Yamamichi, Katsuyoshi (Japan Atomic Energy Research Institute) Japan. 72 08,368 (Cl. C 08/k), 10 Mar 1972, Appl. 68 91,186, 12 Dec 1968; 4 pp. Polyolefins were crosslinked by mixing them with 1-10 wt. % ethylene-vinylidene chloride copolymer (I) [26655-22-1] followed by heating the mixt. to 170-300°. The I was prepd. by radiation polymn. of high d. polyethylene (or polypropylene) with 55 mole % vinylidene chloride.

140969n Heat-resistant fire-resistant resin compositions based on poly(vinyl chloride) and chlorinated polyolefins. Suzuki, Fumio (Sumitomo Electric Industries, Ltd.) Japan. 72 07,628 (Cl. C 08/k), 03 Mar 1972, Appl. 67 10,050, 15 Feb 1967; 4 pp. Heat-resistant, fire-resistant resin compns. were prepd. by chem. or phys. crosslinking of PVC [9002-86-2] (95-50%) and a chlorinated polyolefin (5-50%) in the presence of a chloroparaffin as plasticizer. For chem. crosslinking tribasic lead sulfate and dicumyl peroxide were used as catalysts. Phys. crosslinking was accomplished by β - or γ -irradn. with 0.1-100 Mrad dosage. The resin obtained showed excellent aging resistance as well as heat- and fire resistance. The chlorinated resins used were polyethylene or polypropylene with 45 $\pm$ 20% chlorination.

140970f Prevention of discoloration of methyl methacrylate polymers. Nakazuka, Kazuo; Takamura, Masayoshi (Mitsubishi Rayon Co., Ltd.) Japan. 72 07,629 (Cl. C 08/f), 03 Mar 1972, Appl. 63 56,074, 23 Jan 1963; 2 pp. A heat-stable and



discoloration-resistant poly(Me methacrylate) (I) [9011-14-7] resin compn. was prepd. by mixing the compn. with an equimolar mixt. of *p*-(butyrylamino)phenol (II) [101-91-7] and dilauryl thiodipropionate (III) [123-28-4]. Soln.-polymd. I with d.p. 1390 was mixed with 1% II and III. The compn. contg. the mixt. lost 12.6% of its wt. without discoloration at 250° in 45 min, compared with 30.7% for a compn. contg. no stabilizer. The mixt. was similarly used for emulsion-polymd. I or 99:1 Me methacrylate-methyl acrylate copolymer [9011-87-4].

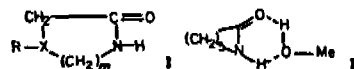
140971g Impact-resistant resin composition from olefinic graft polymers and a vinyl resin. Shiratsuchi, Eiichiro; Terajima, Satoshi (Japan Synthetic Rubber Co., Ltd.) Japan. 72 08,144 (Cl. C 08/f, B 01/), 08 Mar 1972, Appl. 68 62,184, 30 Aug 1968; 8 pp. The title resin compn. was obtained by blending a vinyl resin (exclusive of vinyl chloride) with a graft copolymer obtained by polymn. an olefin rubber with 0.5-15-fold (by wt.) olefinic monomer(s) in the presence of a radical initiator and O₂ or O₃. Thus, 15-70 parts ethylene-propylene-dicyclopentadiene rubber (Royalene 301) and 2 parts dicumyl peroxide were blended for 5 min at 60°, then heated to 150° for 10 min in air and granules 1.5 $\times$ 1.5 $\times$ 1.5 mm in size were prepd. These granules then reacted with 30-85 parts 76:24 styrene-acrylonitrile mixt. with stirring at 70° for 15 hr. The acrylonitrile-dicyclopentadiene-ethylene-propylene-styrene graft copolymer [30396-50-0] obtained was then blended with acrylonitrile-styrene copolymer [9003-54-7] resin at 160° for 10 min.

140972h Vinyl chloride resin composition with good retention of impact strength at elevated temperatures. Kawahara, Tetsuyo; Anno, Hirotomo (Japanese Geon Co., Ltd.) Japan. 72 08,146 (Cl. C 08/d), 08 Mar 1972, Appl. 68 11,991, 27 Feb 1968; 9 pp. The title resin compn. was obtained by blending poly(vinyl chloride) (I) [9002-86-2] with a graft copolymer of a butadiene-type rubber latex. Thus, 10 parts 100:0.5:30:0.5:30 butadiene-methyl acrylate-methyl methacrylate-*N*-methylolacrylamide-styrene graft copolymer [36704-33-3] was added to 100 parts I and blended at 170° for 7 min, then pressed for 15 min at 175° into test specimens. The Charpy impact strength of 31.5 kg-cm/cm² was >3-fold higher than that of a resin obtained from a 100:30:30 butadiene-methyl methacrylate-styrene copolymer.

140973j Olefin-vinyl chloride copolymer composition containing nitrile rubber and poly(methyl methacrylate). Muraoka, Kensuke; Horie, Katsuyuki (Nissan Chemical Industries, Ltd.) Japan. 72 08,147 (Cl. C 08/j), 08 Mar 1972,

Appl. 68 16,890, 16 Mar 1968; 4 pp. The resin compns. obtained by mixing ethylene- or propylene-vinyl chloride copolymer (I) [25119-90-8] (contg. $\geq$ 90% CH₂:CHCl) $\geq$ 70, nitrile rubber 5-20, and poly(methyl methacrylate) (II) [9011-14-7] 5-30% exhibited excellent processibility, transparency, mech. strength, and thermal stability. Thus, 7.4:92.6 I 90, II 5, and acrylonitrile-butadiene copolymer 5 parts were mixed at 160°. The sheet prepd. by heat-pressing of the mixt. at 160° had a tensile strength of 550 kg/cm².

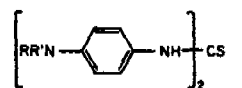
140974k Adducts of lactams and alcohols or mercaptans useful as polymerization solvents. Wagner, Kuno (Farbenfabriken Bayer A.-G.) Ger. Offen. 2,062,288 (Cl. C 07/d), 13 Jul 1972, Appl. P 20 62 288.2, 17 Dec 1970; 63 pp. Very low



viscosity adducts of lactams (I), where R = H and m = 0-9 when X = CH; and R = aliphatic, arylaliphatic, or pyridine group and m = 3 when X = N, and excesses of alcs. or mercaptans were prepd. for use as polymn. solvents. For example, 1131 parts ϵ -caprolactam was heated at 50° with 321 parts MeOH to give a 1:1 ϵ -caprolactam-methanol adduct (II) [36711-68-9] having viscosity 5.9 cP at 28° which dissolved substances which were difficultly sol. in either H₂O or org. solvents. II (303 parts) completely dissolved 60 parts PVC, 40 parts poly(vinyl acetate) or 60 parts poly(methyl methacrylate). The polymers pptd. from the solns. when water was added. II reacted with hexamethylene diisocyanate to give ϵ -caprolactam and MeO.CNH(CH₂)₆NHCO.Me.

140975m Poly(vinyl chloride) plastisols. Berger, Otto; Priese, Hartmut; Koschek, Robert; Born, Erwin Ger. (East) 88,658 (Cl. C 08/f), 12 Mar 1972, Appl. WP C 08/f/152,240, 24 Dec 1970; 9 pp. Low viscosity PVC [9002-86-2] plastisols with high stability and solids content were prepd. by mixing the suspension-prepd. PVC powder and the PVC extender resin powder at 1000-1500 rpm and/or at 40-90°. Thus, suspension-prepd. PVC powder was mixed at 1000 rpm and 52° with dioctyl phthalate (I) and Na fatty alc. sulfonate, then at 22° and 60 rpm with addnl. I, octyl stearate, epoxidized Bu oleate, and a stabilizer, and then at 31° and 1000 rpm with PVC extender resin powder to give a sediment-free, storage stable paste containing a 62:38 PVC-plasticizer ratio.

140976n Polyamide compositions. Mori, Kenjiro; Ikebe, Shigeaki; Kunihiro, Haruo; Kawano, Nobuharu (Sumitomo Chemical Co., Ltd.) Japan. 72 09,749 (Cl. C 08/gj, Q 01/f, C 07/c), 23 Mar 1972, Appl. 68 81,167, 05 Nov 1968; 7 pp.



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The heat resistance of polyamides was improved upon addn. of 1% 1,3-bis(aminophenyl)thioureas (I, R = H or Me; R' = Me, sec-Bu, Ph, or 4-ethoxyphenyl), which were prepd. from CSCl₂ and the corresponding *p*-phenylenediamines. For example, nylon 6 [25038-54-4] contg. 1,3-bis[4-(dimethylamino)phenyl] thiourea (I, R = R' = Me) [13991-81-6] was more heat resistant than one contg. 2-mercaptobenzimidazole, and a compn. contg. both the thiourea and copper acetate was even more heat resistant.

140977p Polyolefin compositions. Saruwata, Kenichi; Gano, Tsuneo; Suenobu, Yukikazu; Itahana, Yoshio (Yoshitomi Pharmaceutical Industries, Ltd.) Japan. 72 09,739 (Cl. C 08/k), 23 Mar 1972, Appl. 68 69,361, 25 Sep 1968; 3 pp. Mixts. of thiodipropionates of myristyl alc. and stearyl alc. gave good thermal stability and weatherability to polyolefins. Thus, 178.2 g thiodipropionic acid, 216 g myristyl alc., 272 g stearyl alc., 1 l. PhMe and 3 g *p*-MeC₆H₄SO₃H were heated at 90-120° with continuous removal of the water formed in the reaction. A light yellow oil (f.p. 50.6°) was obtained contg. myristyl thiodipropionate [16545-54-3] and stearyl thiodipropionate [693-36-7]. The mixed thiodipropionate (0.2 part) was added to 100 parts polypropylene [9003-07-0] to give a film with thermal stability comparable to that stabilized with the distearyl ester and with weatherability comparable to that stabilized with the dilauryl ester.

140978q Stabilization of polycarbonate resins. Ichikawa, Toshiyuki; Takase, Tsutomu; Ema, Kenji (Mitsui Toatsu Chemicals Co., Ltd.) Japan. 72 09,746 (Cl. C 08/k), 03 Mar 1972, Appl. 68 65,472, 11 Sep 1968; 3 pp. The heat stability of bisphenol A polycarbonate [25037-45-0] was improved by addn. of phosphite esters (to a level of 200-300 ppm P). Examples of esters used were triphenyl phosphite [101-02-0] and triaryl phosphite [3076-63-9].

140979r Stabilized polystyrene compositions. Tahara, Minoru; Harata, Yoshitaka (Japan Polystyrene Industry Co.,

stabilizers, accelerators, vulcanization agents, blowing agents, plasticization accelerators, hardeners, and other chems. used in production of plastics was reviewed with 0 refs.

49226g Carborene polymers. Williams, Robert E. (Chem. Syst. Inc., Santa Ana, Calif.). *Pure Appl. Chem.* 1972, 29(4), 569-83 (Eng). A review with 19 refs.

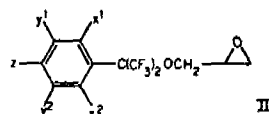
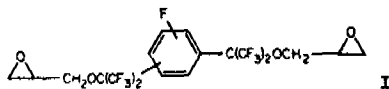
49227h Synthesis and properties of phosphorus-containing sorbents. Leikin, Yu. A.; Rataichak, V. (USSR). *Itogi Nauki, Khim. Tekhnol. Vysokomol. Soedin.* 1971, 3, 86-137 (Russ). Review of the synthesis and phys. and chem. properties of P-contg. sorbents, with 238 refs.

49228j Titanium oxide. Its solid acidity and catalytic effect on the thermal degradation of poly(vinyl chloride). Okazaki, Susumu (Ibaraki Univ., Mito, Japan). *En Bi To Porima* 1972, 12(5), 17-24 (Japan). A review with 27 refs. on the effects of titanium dioxide [13463-67-7] on PVC [9002-86-2] stability.

49229k Improvement of thermal stability in poly(vinyl chloride). Thermal stability and manufacture of heat stable PVC- α 30. Suzuki, Tsunao; Yasuta, Mitsuo; Masuta, Toshio (Nippon Zeon Co., Ltd., Tokyo, Japan). *En Bi To Porima* 1972, 12(5), 25-32 (Japan). A discussion on the comparison of the heat stability of com. poly(vinyl chloride) [9002-86-2] α -30 with that of conventional poly(vinyl chloride), and on its manuf.

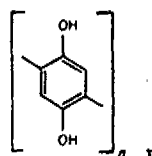
49230d Light-resistance test of plastics. Shiota, Tadashi (Seni Kobunshi Zairyo Kenkyusho, Japan). *Purasuchikkusu* 1972, 23(5), 40-53 (Japan). A discussion on the tests of weathering resistance of plastics.

49231e α -Effect in the amine reactivity of a new class of fluoro-epoxies. Reines, S. A.; Griffith, J. R.; O'Rear, J. G. (Nav. Res. Lab., Washington, D. C.). *Amer. Chem. Soc., Div. Org. Coatings Plast. Chem., Pap.* 1970, 30(2), 263-8 (Eng).



Diglycidyl ethers (I), useful for the prepn. of fluorinated epoxy resins, and their monofunctional model compds. (II, x, y, z = H, F, or CF₃) were prepd. by treating arylbis(trifluoromethyl)carbinols with excess epichlorohydrin. Rate constants for the reaction of II with Bu₃NH in *tert*-amyl alc. were detd. The reaction followed 2nd order kinetics and proceeded via attack by the amine at the terminal epoxy carbon. II contg. F in the *ortho* position were activated; II contg. F or CF₃ in the *meta* or *para* positions were deactivated. F atoms in both *ortho* positions caused a rate increase 8 times that by an F atom in only 1 of the *ortho* positions. The deactivating effect of 2 *meta* substituents was approx. twice that of a single *meta* substituent.

49232f Electron- and ion-exchange resins based on benzoquinone polymers. Paushkin, Ya. M.; Logashin, S. V. (Mosk. Inst. Neft. Khim. Gazov. Prom. im. Gubkina, Moscow, USSR). *Vysokomol. Soedin., Ser. B* 1972, 14(4), 300-1 (Russ).



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The polymn. of benzoquinone in the presence of >5% H₂SO₄ in C₆H₁₀ or C₆H₄ at >90° for 1-4 hr gave benzoquinone polymers (I) of mol. wt. 500-1200, sol. in DMF, Me₂CO, and alkalis. Upon sulfonation with 100% H₂SO₄, the polymers were converted to heat resistant, redox ion exchange resins.

49233g Apparatus for polymerizing quick-hardening plastics under hydraulic pressure. Leonovich, D. Yu. (Lvov, USSR). *Probl. Ortop. Stomatol.* 1970, No. 4, 83-4 (Russ). A hydraulic polymn. reactor was developed for polymg. fast-hardening plastics (e.g., Butacryl [9046-80-1]) used for manufg. dental prosthetics. The reactor operated under hydraulic pressure (≥ 6 atm) and gave good results.

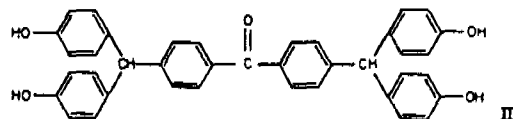
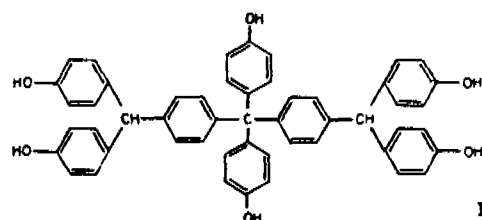
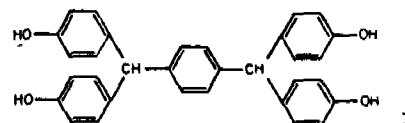
49234h Synthetic leather. New material for the shoe industry. Lasek, Wiktor (Branzowe Lab., Przem. Obuwniczego, Cracow, Pol.). *Polimery* 1971, 16(12), 572-6 (Pol). A discussion with 10 refs. The properties of natural leather are compared with the properties of com. leather substitutes.

49235j Model tests for wear in plastic processing machines. Knappe, W.; Mahler, W. D. (Dtsch. Kunstst.-Inst., Darmstadt, Ger.). *Kunstst.-Rundsch.* 1972, 19(2-3), 45-51 (Ger). The wear resistance is detd. for nitrided steels and special alloys in sliding contact with nylon 66 [32131-17-2], a polycarbonate, or an acrylonitrile-styrene copolymer [9003-54-7] contg. glass fibers or a phenolic contg. wood flour. Nitrided steels have the best wear resistance, and glass fiber-reinforced nylon 66 caused the greatest wear.

49236k Liquid-vapor equilibrium of dimethylaminoethyl methacrylate synthesis products. Pavlov, S. Yu.; Kirnos, A. B.; Pavlova, S. P.; Lazaryants, V. E. (Nauchno-Issled. Inst. Monomerox Sint. Kauch., Yaroslavl, USSR). *Zh. Prikl. Khim. (Leningrad)* 1972, 45(3), 618-22 (Russ). Liq.-vapor equil. were investigated of binary systems consisting of starting materials and products of the synthesis of (dimethylamino)ethyl methacrylate (I) [2867-47-2] via transesterification of Me methacrylate (II) [80-62-6] with (dimethylamino)ethanol (III) [108-01-0] catalyzed by (BuO)₂Ti. The systems included: II-III, II-I, methanol [67-56-1]-III, III-I, Bu methacrylate [97-88-1]-I, and butanol [71-36-3]-III. The pressure dependence of the b.p. of these compds. in pure state was also detd. Deviations from Raoult's law were obsd. and evidence for components assocn. was noted.

49237m Synthesis and study of epoxy furan resins. Itinskii, V. I.; Lamm, V. N.; Maksimova, T. Ya.; Govor, V. P.; Gurtovnik, I. G. (USSR). *Plast. Massy* 1972, (3), 20-1 (Russ). Epoxy-furan resins FAB-1 [34962-78-2], FAB-1.5 [35226-60-9], and FAB-2 [35226-60-9] (the numeral indicates the no. of moles of ED-5 resin used) were prepd. by polycondensation of furfural, Me₂CO, and ED-5 resin in the presence of NaOH. The resins were cured with 12-24% triethanolamine titanate at 120-80° to give corrosion resistant binders for glass laminates. Glass laminates based on FAB-1.5 excelled in mech. properties.

49238n Preparation of epoxy resins based on new polyphenols. Moshchinskaya, N. K.; Dzhoi, A. S. (Dnepropetr. Khim.-Tekhnol. Inst., Dnepropetrovsk, USSR). *Zh. Prikl. Khim. (Leningrad)* 1972, 45(3), 609-14 (Russ). Polyphenols I,



its *m*-xylene analog, II, and III were prepared and reacted with epichlorohydrin to give the corresponding epoxy resins: epichlorohydrin- $\alpha,\alpha,\alpha',\alpha'$ -tetrakis(*p*-hydroxyphenyl)-*p*-xylene copolymer [35397-31-0], epichlorohydrin- $\alpha,\alpha,\alpha',\alpha'$ -tetrakis(*p*-hydroxyphenyl)-*m*-xylene copolymer [35397-32-1], epichlorohydrin- $\alpha,\alpha,\alpha',\alpha'$ -hexakis(*p*-hydroxyphenyl)-*p*-tolymethane copolymer [35397-33-2], and epichlorohydrin- $\alpha,\alpha,\alpha',\alpha'$ -tetrakis(*p*-hydroxyphenyl)-*p*-tolyl ketone copolymer [35397-34-3]. The resins were hardened with maleic anhydride [108-31-6] yielding products of improved Martens heat stability (108-85°) and Brinell hardness (30-42 kg/mm²). The polyphenols were prepd. by reacting the corresponding chloro-compds. with phenol to give quinomethan derivs. and the following redn. Thus, e.g., $\alpha,\alpha,\alpha',\alpha'$ -hexachloro-*p*-xylene gave 1,4-bis[α -(*p*-hydroxyphenyl)]quinomethylbenzene which was reduced to I.

49239p Reaction of urea with formaldehyde in a neutral medium. Vabaoja, J.; Kiisler, K. (USSR). *Sin. Fenolo-Formaldegidnykh Kleevykh Smol Starenie Klevogo Soedin., Respub. Nauch. Konf.* 1971, 56-60 (Russ). Tallin. Politekh. Inst., Tallin, USSR. The noncatalytic condensation of urea [57-13-6] with formaldehyde [50-00-0] in H₂O at 30° was a 2-stage reaction, which at low initial urea-H₂O ratios (*m*), gave primarily dimethylolurea (I) [140-95-4], whereas at *m*, monomethylolurea [1000-82-4] were formed. The reaction was 1st order with respect to CH₂O.

35448u Ion exchangers with amino acid groups. Makarova, S. B.; Bezuevskaya, S. I.; Egorov, E. V. (USSR). *Metody Poluch. Khim. Reaktiv. Prep.* 1970, No. 22, 108-11 (Russ). From Ref. Zh., Khim. 1971, Abstr. No. 118796. Ion exchangers prep'd. by treating chloromethylated *p*-divinylbenzene-styrene copolymers (contg. 2% divinylbenzene) with *Et* aminoacetate [459-73-4], *Et* β -aminopropionate [924-73-2], or *Et* aminobenzoate [106-30-9]. The ion EXCHANGE CAPACITY of the esters was 2.4-3.4 mg/equiv./g in 0.1 N NaOH and 2.6-3.5 mg/equiv./g in 0.1 N HCl.

35449v Polypropylene development, effect of chemical additives. Kinne, H. E. (J. R. Geigy A.-G., Basel, Switz.). *Plast. Plast. Addit., Proc. Int. Conf. Eur. Chem. Mkt. Res. Ass.*, 3rd 1970, 91-100 (Eng). Edited by Perkins, N. A. BP Chem. (UK) Ltd.: London, Engl. The effects of ANTIOXIDANTS, SYNERGISTS, UV STABILIZERS and QUENCHERS on chem. and phys. properties of polypropylene (I) [9003-07-0] are discussed and illustrated. Thus, Luparen 151 I contg. butylated hydroxytoluene, octadecyl 3-(3,5-di-*tert*-butyl-4-hydroxyphenyl)propionate [2082-79-3] or pentaerythrityl tetrakis[3-(3,5-di-*tert*-butyl-4-hydroxyphenyl)propionate] [6683-19-8] antioxidant and dilauryl thiodipropionate [123-28-4] synergist, and Moplen fiber grade I contg. antioxidant and 2-(3,5-di-*tert*-butyl-2-hydroxyphenyl)-5-chlorobenzotriazole [3864-99-1] uv absorber or nickel bis(ethyl 3,5-di-*tert*-butyl-4-hydroxybenzylphosphonate) [30947-30-9] quencher were effectively stabilized.

35450p Crack growth resistance in laminated, glass-epoxy sheet. Kendall, D. P. (Watervliet Arsenal, N. Y.). *U. S. Nat. Tech. Inform. Serv., AD Rep.* 1971, No. 736351, 26 pp. (Eng). Avail. NTIS. From Govt. Rep. Announce. (U.S.) 1972, 72(6), 81. Center-notched glass-epoxy composite panels having FILAMENT ORIENTATIONS of 0° and $\pm 60^\circ$ were loaded in tension normal to the notch direction; extensive stable crack growth was obtained prior to fracture. The instantaneous stress intensity factor was calcd. using theory developed for ISOTROPIC MATERIALS, and was plotted against crack extension to obtain crack growth resistance or 'R' curves.

35451q Factors controlling the strength of composite structures. Mostovoy, Sheldon; Ripling, E. J. (Mater. Res. Lab., Inc., Glenwood, Ill.). *U. S. Nat. Tech. Inform. Serv., AD Rep.* 1970, No. 874429, 85 pp. (Eng). Avail. NTIS. From Govt. Rep. Announce. (U.S.) 1972, 72(6), 111. The fracture toughness and stress corrosion cracking characteristics of ADHESIVE JOINTS consisting of EPOXY RESIN DER 332 [6085-99-8] hardened with either triethylene phosphoramide [545-55-1] or HHPA [85-42-7] were investigated.

35452r Urethane foams for navy pontoon structures. Drisko, R. W. (Nav. Civ. Eng. Lab., Port Hueneme, Calif.). *U. S. Nat. Tech. Inform. Serv., AD Rep.* 1971, No. 736596, 22 pp. (Eng). Avail. NTIS. From Govt. Rep. Announce. (U.S.) 1972, 72(6), 116. Urethane foams for use in navy pontoons and other FLOATING STRUCTURES could be prep'd. successfully in field activities by personnel having little or no experience with foams when care was taken to thoroughly mix the components, obtain the proper ratio of components, avoid contamination of the mixt. and forms (esp. with water), and avoid excessive heat in large pours.

35453s Study of the effect of stabilizer on the degradation of poly(vinyl chloride) by pyrolysis-gas chromatography. Suzuki, Mikio; Tsuge, Shin; Takeuchi, Tsugio (Fac. Eng., Nagoya Univ., Nagoya, Japan). *J. Polym. Sci., Part A-1* 1972, 10(4), 1051-60 (Eng). PVC [9002-86-2] stabilized with dibutyltin dilaurate [77-58-7], dibutyltin bis(dodecyl mercaptide) [1185-81-5], barium stearate [6865-35-6], and zinc stearate (I) [557-05-1] was degraded in N at 350-570° to form benzene; the stabilizers exhibited similar pyrogram patterns. The benzene yield from I-stabilized PVC was much less than that using the other stabilizers, due to a large amt. of CROSSLINKING.

35454t Catalysis of novolacs by *p*-phenolsulfonic acid. Wagner, E. R.; Greff, R. J. (Union Carbide Corp., Bound Brook, N. J.). *J. Polym. Sci., Part A-1* 1972, 10(4), 1195-205 (Eng). The reaction rate of phenol [108-95-2] and aq. formaldehyde [50-00-0] in the presence of *p*-phenolsulfonic acid [98-67-9] was studied. The increase in pH during reaction, which decreased the reaction rate, was correlated with the disappearance of formaldehyde. The consumption of phenol and growth of polymer was det'd. by gel-permeation chromatog. The formation of a 2nd liq. phase during the novolac process was independent of the amt. of catalyst. The liq. 2-phase system and its relation to the reaction rate were exam'd. The final mol. wt. distribution of novolacs was dependent not only on the initial pH of the system also on the pH at the onset of devolatilization.

35455u Polyols and requirements for ambient cure foams. Powell, D. G.; Puig, J. E.; Van Leuwen, B. G. (Olin Corp., New Haven, Conn.). *J. Cell. Plast.* 1972, 8(2), 90-9 (Eng). The components of ambient curing foams were evaluated; the best processing-properties combination was obtained from higher mol. wt. polyols with very high reactivity using a min. amt. of ethylene oxide [75-21-8]. Toluene diisocyanate [26471-62-5]-based foams had good strength but high compression set while

4,4'-diphenylmethane diisocyanate [101-68-8]-based ones had good compression set but low tear and elongation. Dabco WT in low concn. was a good catalyst. A 99:1 blend of DC 200-5 and DC 200-100 DIMETHYLSILOXANES was used to prep. foams; the concn. was crit.

35456v Cold-cured epoxy foam. Turetskii, L. V.; Sokolov, V. A.; Valgin, V. D.; Sergeeva, V. A. (USSR). *Plast. Massy* 1972, (4), 23-4 (Russ). Closed-cell foams of 20-100 kg/m³ d. were obtained by curing epoxy resins (ED-5, ED-6, ED-40) during foaming with BF₃-AMINE complexes (Sokolov, V. A. et al., 1969). The resin contg. FREON(F-11, F-113) is combined with the hardener dissolved in an org. solvent. The concn. of the hardening soln. det's. the rate of the exothermic hardening process and the rate of foaming. The d. of the foam can be changed by altering the hardening soln. concn.

35457w Treatment of poly(vinyl alcohol) with lignin. Gul, V. E.; Bulatnikova, L. I.; Belyatskaya, O. N. (USSR). *Plast. Massy* 1972, (4), 43-5 (Russ). Poly(vinyl alc.) (I) [9002-89-5] was modified with 2% carboxylated lignin (contg. 18% CO₂H groups) to give CROSSLINKED FILMS which excelled in TENSILE STRENGTH and WATER RESISTANCE. A crosslinking mechanism was proposed.

35458x Preparation of syntactic carbon foam. Benton, S. T.; Schmitt, C. R. (Nucl. Div., Union Carbide Corp., Oak Ridge, Tenn.). *Carbon* 1972, 10(2), 185-90 (Eng). A syntactic carbon form with the highest COMPRESSIVE STRENGTH at the lowest bulk d. was made by pressure MOLDING hollow BJO-840, -930, and -931 phenolic resin microspheres with a pitch-furfuryl alc. [98-00-0] binder mixt. and maleic anhydride [108-31-6] catalyst. A compressive strength of >500 psi at d. 0.18 was attained after curing at 150° and carbonizing at 900° in Ar. Higher strength/wt. ratios could be obtained using microspheres of controlled wall thickness and discrete uniform particle size fractions.

35459y Thermal expansion of ribbon-reinforced composites. Gulati, S. T.; Plummer, W. A. (Res. Dev. Lab., Corning Glass Works, Corning, N. Y.). *AIP (Amer. Inst. Phys.) Conf. Proc.* 1972, No. 3, 257-68 (Eng). The thermal expansion coeffs. for THERMOSET and THERMOPLASTIC composites reinforced with RIBBON GLASS are isotropic in the plane of the glass and are smaller (e.g., 37%) than the coeffs. for quasi-isotropic glass fiber composites.

35460s Thermal expansion of carbon-carbon composites as a function of temperature and orientation. Naum, R. G.; Jun, C. K.; Shaffer, P. T. B. (Carborundum Co., Niagara Falls, N. Y.). *AIP (Amer. Inst. Phys.) Conf. Proc.* 1972, No. 3, 279-86 (Eng). The thermal expansion (400-1400°) in the plane of the REINFORCING FIBERS is practically the same for composites comprising carbon fibers in a carbon matrix and GRAPHITE fibers in a carbon or graphite matrix. The expansion perpendicular to the plane of reinforcement is greater in all cases, with the expansion being ~50% greater for the graphite fiber-graphite matrix composite than for the other 2 composites.

35461t Effect of a particulate rigid phase on the properties of glassy thermoplastic polymers. Nicolais, L.; Lavengood, R. E.; Narkis, M. (Mater. Res. Lab., Washington Univ., St. Louis, Mo.). *Quad. Ing. Chim. Ital.* 1972, 8(4), 51-9 (Ital). The ELASTIC MODULUS of thermoplastic materials reinforced with discrete particulate GLASS and carbon [7440-44-0] increased linearly with the filler content and the YIELD POINT was a function of deformation rate. A single master curve, as constructed to represent yield stress as a function of deformation rate, temp., and particle content. Max. ELONGATION and TENSILE STRENGTH were reduced in comparison with the plastic alone when porosity and poor adhesion at the rigid phase-plastic interface lead to the formation of microfractures under stress. MOISTURE CONTENT had little effect on the deformation curves or the Youngs modulus, max. tensile strength, and elongation values. Glass reinforced acrylonitrile-styrene copolymer (I) [9003-54-7], polystyrene [9003-53-6], polyoxyph= enylene and acrylonitrile-butadiene-styrene copolymer [9003-56-9] and carbon reinforced I were tested.

35462u Chemical mechanism of the heat stabilization of poly(vinylchloride) by metal carboxylates. Fuchsman, Charles H. (Cleveland, Ohio). *Kunststoffe* 1972, 62(3), 189-91 (Ger). The reaction of zinc [7440-66-6] (or cadmium [7440-43-9]) carboxylates with HCl formed in thermal degradation of PVC [9002-86-2] forms COORDINATIVELY UNSATD. RCO₂ZnCl₂, which stabilizes by coordination with a reactive allylic Cl in the polymer chain. Carboxyl-Cl interchange in the complex then yields zinc chloride [7646-85-7] and a thermally stable ALLYL ESTER, which interrupts conjugation in the polymer. A similar reaction between complex and a 2nd unsatd. polymer chain may lead to CROSSLINKING. Barium [7440-39-3] carboxylates are less able to coordinate, but function by neutralization of ZnCl₂, which is an active DEHYDROCHLORINATION CATALYST.

35463v Heterogeneous polymeric systems. II. Polyblends containing saturated rubbers. Baer, Massimo (Hydrocarbons Polym. Div., Monsanto Co., Springfield, Mass.). *J. Appl. Polym. Sci.* 1972, 16(5), 1125-38 (Eng). The rubber-phase

Petrochemia 1971, 11(4), 120-2 (Slo). The properties and uses of Czechoslovakian *Delotherm* [11137-47-6] heat-transfer liq., *Delor* [11137-46-5] chlorinated biphenyl plasticizers, and *Hydeler* [137-50-1] synthetic lubricant are REVIEWED. V. Horak

20441n Preparation and properties of chemosetting hydrocarbon resins. Zuchowska, Danuta (Inst. Technol. Org. Tworzyw Sztucznych, Politech. Wroclawska, Wroclaw, Pol.). *Pr. Nauk. Inst. Technol. Org. Tworzyw Sztucznych Politech. Wroclaw*, 1972, No. 8, 3-19 (Pol.). A REVIEW of Na-catalyzed copolymn. yielding low-mol. wt., liq. *butadiene-styrene* copolymer [9003-55-8] crosslinkable with vinyl monomers. 57 refs.

20442p Use of urea for synthesizing plastics. Wirpsza, Zygmunt (Zakl. Poliesterow Epoksydow, Inst. Chem. Przem., Warsaw, Pol.). *Pr. Nauk. Inst. Technol. Org. Tworzyw Sztucznych Politech. Wroclaw*, 1972, No. 6, 46 pp. (Pol.). A REVIEW with 91 refs. contg. a summary of research by W. et al. since 1956.

20443q Legal specification for plastics for electrical appliances and materials. Inuma, Masataka (Tsusansho, Tokyo, Japan). *En Bi To Porima* 1972, 12(3), 18-25 (Japan). A REVIEW without refs. on the fire and heat resistances of plastics used in elec. appliances.

20444r Evaluation of polymeric materials for thermal aging properties and flammability at Underwriters' Laboratories, Inc. Ono, Motonobu (Japan Mach. Met. Inspect. Inst., Japan). *En Bi To Porima* 1972, 12(3), 26-32 (Japan). A REVIEW without refs.

20445s Plastic materials manufacturers and their products in Japan recognized by Underwriters' Laboratories. Ono, Motonobu (Japan Mach. Met. Inspect. Inst., Japan). *En Bi To Porima* 1972, 12(3), 33-6 (Japan). A REVIEW without refs. on the fire and heat resistances of com. plastics.

20446t Thermal requirements for domestic appliances in European countries. Tomizawa, Kazuyuki (Japan Electr. Test. Lab., Japan). *En Bi To Porima* 1972, 12(3), 37-9 (Japan). A REVIEW without refs. on the fire and heat resistances of plastics used in elec. appliances.

20447u Adhesion of polymers and adsorption on glass-like surfaces. II. Clark-Monks, Colin; Ellis, Bryan (Dep. Glass Technol., Sheffield Univ., Sheffield, Engl.). *Trans. Indian Inst. Soc.* 1970, 29(6), 35N-43N (Eng.). A REVIEW with 107 refs. Polymers, esp. polyesters and epoxy resins, and their glass FIBER COMPOSITES are discussed.

20448v Fire resistance treatment of plastics. Hatano, Akira; Yamaguchi, Masao (Daihachi Kagaku Kogyosho, Ltd., Osaka, Japan). *Kobunshi Kako* 1971, 20(12), 720-30 (Japan). A REVIEW with 30 refs.

20449w Modification and uses of poly(vinyl acetate) resins. Mori, Tutomu; Ando, Takuo (Appl. Lab., Nippon Synth. Chem. Ind., Co., Ltd., Osaka, Japan). *Kobunshi Kako* 1971, 20(12), 731-4 (Japan). A REVIEW with 4 refs.

20450q New aromatic additives. Enomoto, Satoshi (Kureha Kagaku Kogyo Co., Ltd., Tokyo, Japan). *Kobunshi Kako* 1971, 20(12), 735-41 (Japan). A REVIEW with 3 refs. on aromatic additives for epoxy resins and polyurethane elastomers.

20451r Homogeneous epoxy resin mixtures. Tanaka, Yoshinobu (Alpha Tech. Res. Inst., Ltd., Japan). *Kobunshi Kako* 1971, 20(12), 749-51 (Japan). A REVIEW with 9 refs. on curing agents for epoxy resins.

20452s Additives [for plastics]. Law, Charles (Corpus Res., Toronto, Ont.). *Can. Plast.* 1971, 28(8), 20-4, 28 (Eng.). A REVIEW with no refs. Plasticizers, heat stabilizers, colorants, org. brighteners, fire retardants, antioxidants, and uv stabilizers are discussed.

20453t Cellulose acetate and polyester film bridge the generation gap. Mackenzie, K. J. (Celanese Plast. Co., Greer, S. C.). *Adhes. Age* 1972, 15(4), 22-6 (Eng.). The prepn. and use of cellulose acetate [9004-35-7] and poly(ethylene terephthalate) [25038-59-9] films for pressure sensitive ADHESIVE TAPES were REVIEWED with 0 refs.

20454u Fatigue of composites. Salkind, M. J. (Skorsky Aircr. Div., United Aircr. Corp., Stratford, Conn.). *Amer. Soc. Test. Mater., Spec. Tech. Publ.* 1972, STP 497, 143-69 (Eng.). The fatigue behavior and failure modes of reinforced plastic composites are REVIEWED with 84 refs.

20455v Acoustic emission from composite materials. Liptai, R. G. (Lawrence Radiat. Lab., Univ. California, Livermore, Calif.). *Amer. Soc. Test. Mater., Spec. Tech. Publ.* 1972, STP 497, 285-93 (Eng.). A REVIEW with 10 refs. The use of acoustic emission anal. to evaluate material properties and defect structure is described, and sources of acoustic emission in composite materials, esp. GLASS FIBER-EPOXY COMPOSITES, under strain are discussed.

20456w Superheat-resistant plastics. Hayashi, Toshio (Marusho Sangyo Co., Ltd., Tokyo, Japan). *Kobunshi Kako* 1972, 21(1), 20-30 (Japan). A REVIEW without refs.

20457x Glass/resin-reinforced plastics in the chemical industry. Terme, L. (Dep. Dev. Mark., Soc. Verre Text. Saint Gobain, Paris, Fr.). *Chim. Ind., Genie Chim.* 1972, 105(6),

357-62 (Fr.). A REVIEW with no refs. of properties and applications of glass reinforced plastics.

20458y Glass used with PTFE [poly(tetrafluoroethylene)]. Mouly, M. (Fr.). *Chim. Ind., Genie Chim.* 1972, 105(6), 371-2 (Fr.). A REVIEW with no refs. of the properties and applications of poly(tetrafluoroethylene) (I) [9002-84-0] and glass fiber reinforced I as SEALS and connection parts.

20459z Chemistry of polyester resins. Parkyn, Brian (Scott Bader Co., Ltd., Wollaston/Wellingborough/Northamptonshire, Engl.). *Composites* 1972, 3(1), 29-33 (Eng.). The history and chemistry of com. available polyester resins and their curing mechanisms are REVIEWED with 30 refs.

20460t Polymer purification made easier in HDPE [high-density polyethylene] route. Heath, Andrew (McGraw-Hill World News, Milan, Italy). *Chem. Eng. (N. Y.)* 1972, 79(7), 66-7 (Eng.). The manuf. of high-d. polyethylene [9002-88-4] using an Al alkyl-Ti compd. supported HETEROGENEOUS CATALYST which obviates the need for the polymer purification step was DISCUSSED.

20461u Polymer-plant engineering. Materials handling and compounding of plastics. Strassburger, Fred (Crawford and Russell Inc., Stamford, Conn.). *Chem. Eng. (N. Y.)* 1972, 79(7), 81-8 (Eng.). The use of pneumatic conveyors, dust collectors, extruders, mixers, kneaders, pelletizers, blenders, etc. in the material handling and compounding of polymer powders, beads, flakes, etc. is REVIEWED with 4 refs.

20462v Reinforced plastics. Composition, processing and characteristics. Moerman, G. (Neth.). *Ingenieurs* 1971, (12), 17-20, 22-4, 26-30; 1972, (1), 18-20, 22-3, 25-8, 30-1 (Neth.). A DISCUSSION, with 12 refs., of the composition, processing, and properties of reinforced plastics.

20463w Improvement of PVC thermal stability. Basic principle and stability of improved PVC. Suzuki, Tsunao; Yasuo, Mitsuo; Masuda, Toshio (Cent. Res. Lab., Nippon Zeon Co., Ltd., Tokyo, Japan). *Jap. Plast.* 1972, 6(1), 11-16 (Eng.). The improvement of the thermal stability of poly(vinyl chloride) [9002-86-2] by modifying polymn. conditions was REVIEWED with 13 refs.

20464x Properties and areas of use of filled thermoplastic materials. Karpov, V. N. (USSR). *Sb. Tr., Vses. Nauch.-Issl. ed. Inst. Nov. Stroit. Mater.* 1971, No. 29, 53-7 (Russ.). A REVIEW with 9 refs.

20465y Basic physical factors in adhesion. Koehler, R. (Duesseldorf, Ger.). *Adhesion* 1972, No. 2, 41-7; (3), 66-70, 73 (Ger.). A REVIEW, with 46 refs., of adhesion theories.

20466z Semihard and hard polyurethane foams. Iwata, Yoshiharu (Nippon Polyurethane Kogyo Co., Ltd., Japan). *Purasuchikkusu* 1972, 23(4), 9-16 (Japan). A REVIEW with 4 refs.

20467a Strong polyurethane. Nakata, Shoji (Sumitomo Bayer Urethane Co., Ltd., Japan). *Purasuchikkusu* 1972, 23(4), 17-24 (Japan). A REVIEW with 13 refs. on the properties of polyurethane foam molding products.

20468b Polymerization of urethane by the prepolymer and one-shot methods. Yoshita, Shigeru (Nippon Ink Kagaku Kogyo Co., Ltd., Japan). *Purasuchikkusu* 1972, 23(4), 25-30 (Japan). A REVIEW with 10 refs.

20469c Hard polyurethane. Karashi, Akizo; Nakahara, Tokonobu (Taketa Yakuhin Kogyo Co., Ltd., Japan). *Purasuchikkusu* 1972, 23(4), 31-5 (Japan). A REVIEW with 21 refs. on the prepn. of polyurethane foams, fire retardants for polyurethane foams, and vinyl-crosslinked polyurethane foam.

20470w Footwear elastomers and heat insulation polymers. Wakabayashi, Akira; Hamaguchi, Kentaro (Toyo Gum Kogyo Co., Ltd., Japan). *Purasuchikkusu* 1972, 23(4), 36-41 (Japan). A REVIEW with 6 refs. on polyurethane foam footwear, polyurethane foam heat insulation materials, and phys. properties of the foam.

20471x Processing of poly(vinyl chloride) paste resin. 3. Okata, Atsushi (Mitsubishi Monsanto Co., Ltd., Japan). *Purasuchikkusu* 1972, 23(4), 99-104 (Japan). A REVIEW without refs.

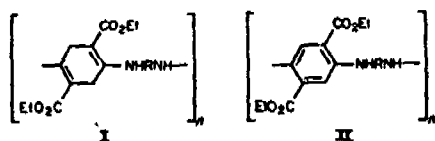
20472y Irradiation effects of radioactivity for molding polymer. Kimura, Hiroshi; Yamaguchi, Takuji; Imachi, Masaki; Uematsu, Masakazu (Dept. Text., Fukui Univ., Fukui, Japan). *Fukui Daigaku Kogakubu Kenkyu Hokoku* 1971, 19(1), 45-51 (Eng.). Changes in the MOLDING CHARACTERISTICS caused by ⁶⁰Co irradiation of high-pressure polyethylene [9002-88-4] included decreased elongation and tensile strength. The magnitude of the effects was increased in the presence of water or by increasing the temp. T. Okada

20473z Duromer, polyurethane structural foam. Bernard, David (Mobay Chem. Co., Pittsburgh, Pa.). *Proc., Conf., Reinf. Plast./Compos. Div., Soc. Plast. Ind.* 1972, 27, 1D, 1-4 (Eng.). A DISCUSSION with no refs. of Duromer [9044-42-2] polyurethane structural foam.

20474a Derakane vinyl ester resins. Unique chemistry for unique SMC [sheet molding compound] opportunities. Stavinoha, R. F.; MacRae, J. D. (Dow Chem. Co., Freeport, Tex.). *Proc., Conf., Reinf. Plast./Compos. Div., Soc. Plast. Ind.*

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60270s Chemical thermodynamics of polymerization of formaldehyde in an aqueous environment. Bryant, W. M. D.; Thompson, John B. (Plast. Dep., E. I. du Pont de Nemours and Co., Wilmington, Del.). *J. Polym. Sci., Part A-1* 1971, 9(9), 2523-40 (Eng). A self-consistent set of thermodynamic values for polymn. of HCHO in a GAS PHASE and an aq. environment is calcd. from a set of exptl. thermochem. values and some calcd. data. ENTHALPIES, ENTROPIES, and FREE ENERGIES OF FORMATION are derived for the various intermediates and products, including the first six HYDROXY-TERMINATED OLIGOMERS. Simple equations for equil. const. as a function of temp. are presented and agree reasonably well with exptl. results.

60271t Vacuum and oxidative pyrolysis of poly-p-xylylene. II. Chromatographic analysis and kinetics of reaction products. Jellinek, H. H. G.; Ronel, S. H. (Clarkson Coll. Technol., Potsdam, N. Y.). *J. Polym. Sci., Part A-1* 1971, 9(9), 2605-15 (Eng). THE ACTIVATION ENERGY for each of the products of thermal degradation of poly(p-xylylene) [25722-33-2] in vacuum was not the same. Each product was formed by a reaction which had its own characteristic no. av. KINETIC CHAIN LENGTH. Oxidative degradation produced the same org. compds. as vacuum degradation and additionally CO, CO₂, and H₂O. Oxidized intermediates were rapidly decarboxylated and decarbonylated. Oxidative chain scission was appreciably faster than that in vacuum.

60272u Coordination catalysts for the selective hydrogenation of polymeric unsaturation. Falk, John C. (Roy C. Ingersoll Res. Cent., Borg-Warner Corp., Des Plaines, Ill.). *J. Polym. Sci., Part A-1* 1971, 9(9), 2617-23 (Eng). Hydrogenation catalysts which selectively discriminate between different types of polymeric unsatn. were prepd. by treatment of triethylaluminum [97-93-8] or an ORGANOLITHIUM compd. with Ni or cobalt 2-ethylhexanoate [136-52-7]. The order of activity in the hydrogenations studied with these catalysts was 1,4-polybutadiene [9003-17-2] > 1,4-polyisoprene [9003-31-0] > polystyrene [9003-53-6]. The effects of catalyst concn., Al or Li/transition metal ratio, and alkyl metal sources were discussed.

60273v Mechanism of action of some stabilizers in the thermal degradation of poly(vinyl chloride). Razuvaev, G. A.; Troitskaya, L. S.; Troitskii, B. B. (Inst. Chem., Gorkii, USSR). *J. Polym. Sci., Part A-1* 1971, 9(9), 2673-88 (Eng). The activity of stabilizers such as org. salts of Ca, Ba, or Cd and trialkyl phosphates against thermal degradation of poly(vinyl chloride) [9002-86-2] depends primarily on the efficiency of HCl absorption and polyene unit destruction by these compds. The accelerating effect of HCl is connected with interaction with forming polyene units in the PVC structure.

60274w Hydrolysis of n-butyl acetate with various polymeric sulfonic acids. Sakaguchi, Yasuyoshi; Yamada, Junichi; Tamaki, Katsuyuki; Nishino, Jun (Dep. Appl. Chem., Konan Univ., Kobe, Japan). *Kobunshi Kagaku* 1971, 28(317), 755-60 (Japan). The CATALYTIC EFFECT of polymeric sulfonic acids for the hydrolysis of AcOBu in aq. soln. increased with increasing contents of sulfo groups in the acids. The polymeric sulfonic acids were prepd. by sulfonating various homo- and copolymers, such as polystyrene [9003-53-6] and poly(vinylnaphthalene). Sulfonated polymers contg. hydrophobic units showed generally high catalytic effect, but some sulfonated polymers with high HYDROPHOBICITY showed low catalytic effect. The catalytic effect depended also on the STERIC CONDITIONS between the acid and AcOBu.

60275x Hydrolysis of some low-molecular-weight and polymeric esters with various polymeric sulfonic acids. Sakaguchi, Yasuyoshi; Tsujimoto, Yoshimasa; Tamaki, Katsuyuki; Nishino, Jun (Dep. Appl. Chem., Konan Univ., Kobe, Japan). *Kobunshi Kagaku* 1971, 28(317), 761-5 (Japan). Me acetate [79-20-9], tert-Bu acetate [540-88-5], di-Me fumarate [624-49-7], di-Me maleate [624-48-6], partially acetylated poly(vinyl alc.) [9002-89-5], and vinyl acetate-vinylpyrrolidone copolymer [25036-89-9] were hydrolyzed in aq. solns. with various polymeric sulfonic acids. The polymeric sulfonic acids were prepd. by sulfonating various homo- and copolymers, such as polystyrene [9003-53-6] and poly(vinylnaphthalene). The CATALYTIC EFFECT of the acids was increased by the HYDROPHOBICITY of the acids, but affected by the STERIC FACTOR between the acids and the esters. The partial neutralization of the acids with laurylamine reduced the catalytic effect of the remaining sulfo groups due to an increase

in the steric hindrance. The binding tendency between the acid and Et aminobenzoate was controlled by the hydrophobic interaction and steric factor in addn. to electrostatic interaction.

60276y Electron spin resonance study of polyethylene irradiated with ultraviolet light. Tsuji, Kozo; Saito, Toshifumi (Cent. Res. Lab., Sumitomo Chem. Co., Ltd., Takatsuki, Japan). *Polym. J.* 1971, 2(5), 605-22 (Eng). In the ESR spectra of polyethylene [9002-88-4] irradiated with uv light at -196°, 2 types of FREE RADICALS -CH₂CHC(=O) and -CH₂CH₂ were obsd. The latter radicals were reactive and abstracted H atoms from the polymer chains to form the form radicals. When the temp. of the irradiated samples was increased, acyl radicals CH₂CH(CO)CH₂ appeared at -125° and allylic radicals at approx. -30°. The primary process at -196° was considered to be Norrish type I reaction of carbonyl group. In O atm., CHARGE TRANSFER COMPLEXES of O with polyethylene formed, and were shown to participate in the formation of radicals.

60277z Simple dialysis cell for solutions of polymers in mixed solvents. Guthrie, J. T.; Huglin, M. B.; Phillips, G. (Dep. Chem., Univ. Salford, Salford, Engl.). *Makromol. Chem.* 1971, 149, 309-12 (Eng). A dialyzer which allows the measurement of the sp. REFRACTIVE INDEX increment (Δ_D) by differential refractometry or interferometry was constructed comprising a Visking bag connected to a capillary tube through a poly(tetrafluoroethylene) sleeve joint. The polymer soln. in the mixed solvent (0.005-0.025 g/ml) was introduced simultaneously with the mixed solvent into the bag and outside tube, resp. with sep. syringes, after dialysis, the soln. and solvent were withdrawn, and the Δ_D measured, Δ denotes the value of Δ at const. chem. potential. The Δ_D and Δ_D of poly(Me methacrylate) [9011-14-7] in 42:58 PhMe-MeOH mixt. are 0.094 and 0.15 ml/g, resp.

60278a Chemically Reactive Polymers; an Inaugural Lecture Delivered in the University of Birmingham on 19th May 1970. Barker, Sidney A. (Suttons: Birmingham, Engl.) 1970. 14 pp. 4 s.

60279b ε-Caprolactam. Fujita, Yutaka; Naruchi, Tatsuyuki; Yoshisato, Eishin (Teijin Ltd.) Ger. Offen. 2,111,216 (Cl. C 07d, B 01j), 30 Sep 1971, Japan. Appl. 09 Mar 1970-28 Dec 1970; 80 pp. ε-Caprolactam (I) [105-60-2], starting compd. for the manuf. of nylon 6, was prepd. without AMMONIUM SULFATE FORMATION by vapor phase reaction of ε-caprolactone (II) (or ε-hydroxycaproates), H and NH₃ (1:10-50:2-25 molar ratio) in the presence of a CATALYST system consisting of metallic copper [7440-50-8] on TiO₂, Al₂O₃, Al₂O₃-SiO₂, or SiO₂ (av. particle size 10-50 μ) at 220-310° and 0.1-1.2 atm. Thus, 160 g TiO₂ was suspended in 121.6 g Cu(NO₃)₂·3H₂O in 1 l. H₂O, the pH adjusted to 7.5 by 10% Na₂CO₃, the mixt. kept overnight, and the filtered powder calcined to give a product of 20:80% CuO-TiO₂ ratio, which was reduced with H to give a catalyst of 0.20:1 Cu-TiO₂ ratio. H 0.23, NH₃ (g) 0.05, and 11 0.01 l./min were passed over 68 g of the above catalyst at 250° under N for 3 hr to give 78% I at 87% II conversion and 90% selectivity, ε-hydroxycaproic acid, its NH₄ salt, and II by-products. The above catalyst system was further improved by addn. of minor amts. of Ni or Cr₂O₃.

60280v Adipic acid. Kawaguchi, Takeo; Matsubara, Takashi (Toa Gosei Chemical Industry Co., Ltd.) Japan. 71 34,408 (Cl. C 07c, B 01d), 08 Oct 1971, Appl. 27 May 1968; 4 pp.



In the manuf. of adipic acid (I) [124-04-9] by LIQ. PHASE OXIDN. of cyclohexane, cyclohexanol, and (or) cyclohexanone in AcOH, I crystals were sepd. by crystg. the reaction mixt., the resulting mother liquor subjected to an azeotropic distn. with cyclohexyl acetate and (or) cyclohexanone; the dehydrated mother liquor was recycled to the oxidn. stream so that the reaction proceeded continuously.

H. Kataoka
60281w ε-Caprolactam from cyclohexane. Ishimoto, Yasuo; Togawa, Haruo; Nakagawa, Koji; Yamamoto, Kiyoshi; Naruchi, Tatsuyuki; Matsui, Hideo; Saiki, Tadatsugu (Teijin Ltd.) Japan. 71 31,538 (Cl. C 07d), 13 Sep 1971, Appl. 29 May 1968; 6 pp. ε-Caprolactam (I) [105-60-2] was prepd. by oxidizing cyclohexane (II) and/or cyclohexanone (III) with O, and reducing the aq. extract to form an acid mixt., which was reduced and aminated at 200-300° in the presence of a hydrogenation catalyst and heated at 300-400° with NH₃ and H₂O without a catalyst. Thus, 0.51 l./hour II contg. III 6.3, cyclohexanol 3.9, and cyclohexyl peroxide 3% was heated at 130° and 15 kg/cm² for 17 hr with 90 l./hour air. The mixt. was extracted with H₂O, and the extract was hydrogenated 20 min in the presence of 5 g Pt/C (5%) and filtered. The filtrate was

owed good flexibility and SCRATCH RESISTANCE, and then used for bonding steel, ADHESIVE STRENGTH 1447 psi. Resistance to WEATHERING and AGING was good. Use of after I (34% nitrile) reduced adhesive strength but not flexibility or scratch resistance. Epoxy resin was cured by 20% hr at 150° or 20 min at 200°, but not by 15% II at either temp.

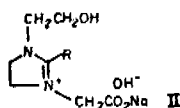
46828y Adhesion of copper foil to epoxy glass laminates. Chakravarty, A. P.; Munje, I. L.; Debnath, K. K.; Ganguli, K. C. (Def. Res. Lab. (Mater.), Kanpur, India). *Labdev, Part A* 1971, 9(1), 46-8 (Eng). In the prepn. of laminates of copper 7440-50-8 with glass fiber-reinforced epoxy resin, PEEL STRENGTHS of 8-10 lb/in (MIL-P-13949D) were achieved by electrolytic treatment of the Cu at current d. 0.014 amp./in² in 2% CuSO₄ soln. in 10N NaOH, priming with compounded nitrile rubber (33% nitrile), curing 15 min at 160°, applying the glass fabric contg. B-stage epoxy resin, and curing 60 min at 160°/500 psi. The priming mechanism may involve formation of Cu₂S, which reacts with rubber unsatn.

46829z Boric acid esters as secondary plasticizers for poly(vinyl chloride). Potnis, S. P.; Khanolkar, A. G. (Dep. Chem. Technol., Univ. Bombay, Bombay, India). *J. Polym. Sci., Part C* 1971, No. 33, 161-9 (Eng). Use of boric acid [10043-35-3] esters as secondary plasticizers for PVC [9002-86-2] gave improved ELEC. PROPERTIES, HEAT STABILITY, and FIRE RESISTANCE. Replacement of 10-20% primary plasticizer by triethyl borate [2467-12-1] gave the best elec. properties. Replacement of 30-50% dioctyl phthalate by tris(2-methylcyclohexyl) borate [24848-82-6] gave TRANSP= ARENT plastic with good properties at moderate temps. COMPATIBILITY of borates was not sufficient for their use as primary plasticizers, while that of borate polyesters was too low for use as secondary plasticizers.

46830t Effect of methyl cellulose-added syrup on the seal strength of polyethylene pouches. Saigo, Hideaki; Shimoda, Yoshio (Toyo Shokuhin Junior Coll., Kawanishi, Japan). *Toyo Shokuhin Kogyo Tanki Daigaku, Toyo Shokuhin Kenkyusho Kenkyu Hokokusho* 1970, 60(9), 62-7 (Japan). The seal strength of pouches made of low d. polyethylene (I) [9002-88-4] contg. 10 ppm Me cellulose (II) [9004-67-5] is lower than that of high d. I contg. the same amt. of II. K. Noda

46831u Stabilization of poly(vinyl chloride) with organotin compounds. Minsker, K. S.; Fedoseeva, G. T.; Zavarova, T. B.; Krats, E. O. (Bashk. Gos. Univ., Ufa, USSR). *Chem. Abstr. Ser. A* 1971, 13(10), 2265-78 (Russ). Experiments conducted with 20 organotin stabilizers (e.g., trichloroobutyltin [1118-46-3], tetraphenyltin [595-90-4], and dichlorodibutyltin [683-18-1]) suggested that the stabilizers exerted a multiple effect on poly(vinyl chloride) [9002-86-2] viz., as HCl acceptors, dienophiles, inhibitors of DEHYDROCHLORINATION and plasticizers. The effectiveness of the stabilizers depended on the substituents. Thus, stabilizers contg. a Sn-Cl bond increased the INDUCTION PERIOD, whereas org. substituents primarily accounted for the TOXICITY, COMPATIBILITY, and light stabilizing effects.

46832v New antistatics for plastics. Vasilenok, Yu. I.; Konoplev, B. A.; Lagunova, V. N.; Simonov, A. M.; Pozharskii, A. F.; Zvezdina, E. A.; Adreichikov, Yu. P. (USSR). *Plast. Massy* 1971, (10), 11-13 (Russ). The



immersion of polyethylene (I) [9002-88-4], polystyrene [9003-53-6], or poly(Me methacrylate) [9011-14-7] films in 2% alc. solns. of 1-(β-hydroxyethyl)-3-carboxymethyl-2-nonyl-Δ²-imidazolium hydroxide Na salt (II, R is nonyl) [33991-62-7], II(R is undecyl), or II(R is tridecyl) at 20° for 10 sec and drying at room temp. decreased their SURFACE ELEC. RESISTANCE (ρ) from 8 × 10¹⁵ to the 10⁹ ohm range. Other IMIDAZOLIUM SALTS, such as N-(β-hydroxyethyl)-2-nonylimidazolium adipate [33936-03-7] or 1-(β-hydroxyethyl)-2-aminomimidazolium bromide [33936-04-8] have lower antistatic activity. The presence of II on the surface of I had no effect on its mech. properties.

46833w Effect of the chemical structure of polyester plasticizers on the viscoelastic properties of poly(vinyl chloride). Perepechko, I. I.; Ushakov, L. A.; Barshtein, R. S. (USSR). *Plast. Massy* 1971, (10), 35-9 (Russ). The viscoelastic properties of poly(vinyl chloride) (I) [9002-86-2] (of 100 wt. 61,000) plasticized with polyester plasticizers of the general formula BuO·C(CH₃)₂·CO[OR·C(CH₃)₂·CO]·OBu (where R is a glycol radical, e.g., alkylene, hydroxyalkylene, or isoalkylene) showed that the plasticizing effect of the polyester increased with the no. of CH₂ groups in the glycol portion of the mol. The COMPATIBILITY of several plasticizers with I was

detd. The most compatible plasticizer had a Me side group in the glycol portion of the mol.

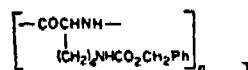
46834x Statistical optimization of phosphor-binder composition water resistance. Dubovitskaya, I. M.; Kazarin, I. G.; Tammik, A. (USSR). *Tartu Riikliku Ülikooli Toim.* 1971, No. 271, 97-111 (Russ). The 2¹ factorial exptl. design, used to optimize the EPOXY RESIN potting compn. for a LUMINESCENT POWDER, involved the following variables: the presence or absence of reactive plasticizer, the presence or absence of INERT PLASTICIZER (or inert diluent), and the use of an AMINE or POLYAMIDE HARDENER. The optimization of the water resistance also optimized its resistance to FLAKING.

46835y Effect of the chemical structure of several stabilizers on their effectiveness. Akhmedzade, D. A.; Yasnopolskii, V. D.; Golovanova, Yu. I. (Inst. Neftekhim. Protsess., Baku, USSR). *Azerb. Khim. Zh.* 1970, (5-6), 37-40 (Russ). Of the 10 stabilizers tested (several had a benzophenone-related structure), polypropylene (I) [9003-07-0] was best stabilized with 2,6-dibromophenolindophenol (sic). Addn. of stabilizers to I followed by pressing caused degradation of the supramol. structure. On heat treatment, a new supramol. structure was formed, resulting in increased mech. strength.

46836z Acetal-PTFE resin blend improves properties and processing. Estell, Robert E. (Plast. Div., Garlock, Inc., Camden, N. J.). *Plast. Des. Process.* 1971, 11(10), 35-7 (Eng). Gylon Lubetal, a blend of acetal copolymer and poly(tetrafluoroethylene) fibrous flakes, has improved TENSILE STRENGTH, shear strength, fatigue endurance, resilience, and ABRASION RESISTANCE and is used for manufg. cams, gears, valve seats, and bearings and as a MOLD RELEASE AGENT.

46837a Antioxidative stabilization of poly(vinyl chloride). Stapfer, Christian H.; Granick, Joel D. (Cincinnati Milacron Chem. Inc., New Brunswick, N. J.). *J. Polym. Sci., Part A-1* 1971, 9(9), 2625-36 (Eng). The DEGRADATION of poly(vinyl chloride) (I) [9002-86-2] is increased in the presence of O because of the autoxidn. of the polymer, followed by DEHYDROCHLORINATION. The dehydrochlorination of I at 175° in o-Cl₂C₆H₄ was examd. in presence or absence of O and stabilizers such as thiollauric anhydride [19659-64-4] (low stabilizing effect), diisooctyl dithiodipropionate [3381-78-6], alkylidene bis(mercapto ester), dialkyl disulfide [2757-37-1], and alkylidene bis(lauryl mercaptole) (high stabilizing effect). ORGANOTIN COMPDs. were added as co-stabilizers to stabilize the labile Cl and to eliminate the early discoloration. Phenolic antioxidants and thiotin compds. such as dibutyltin bis(isooctylthioglycolate) [25168-24-5] prevent the oxidative crosslinking of I. The stabilization mechanisms are discussed.

46838b Heterogeneous network polymers. Poly-ε-N-carb=obenzoxy-L-lysine crosslinked with isocyanate-terminated polyethers. Tanaka, Takehide; Yokoyama, Tetsuo; Yamaguchi, Yukio; Furukawa, Mutsuhisa; Mori, Tetsuo (Fac. Eng., Kyushu Univ., Fukuoka, Japan). *J. Polym. Sci., Part A-1* 1971, 9(9), 2745-9 (Eng). Poly(ε-N-carbobenzoxy-L-lysine) (I)



[25931-47-9], prepd. according to the N-carboxyanhydride method, was crosslinked with isocyanate-terminated polyethers in ACNMe to give a noncryst. heterogeneous network polymer whose structure shows the branching points of the polymer crosslinked through the reaction of side urethane group of I and isocyanate-terminated polyether. The isocyanate-terminated polyethers, were prepd. by treating poly(oxyethylene) glycol [25322-68-3] or poly(oxypropylene) glycol [25322-69-4] with a diisocyanate such tolylene diisocyanate [26471-62-5]. The ir and x-ray spectra of network polymers are discussed. The network polymer has a single glass transition and it is not a simple adduct of the component polymers but a composite.

46839c Apparatus for polymerizing a plastic material. Milner, Sanford N. (Milner Corp.) *Fr. Demande* 2,043,529 (Cl. C 08/g), 26 Mar 1971, US Appl. 19 May 1969; 29 pp. Crude plastic material was AUTOMATICALLY polymd. in an app. which contained a HEATING ZONE to heat the plastic to polymg. temp., and means of automatically transferring the material after polymn. to a COOLING ZONE. A rolling carriage within the cylindrical assembly line chamber provided the means for automatic relay from zone to zone. The polymd. material transported to the cooling zone was sprayed with cooling fog or water. Air was circulated into the chamber in the opposite direction to that of assembly movement.

46840w 4-(Carboxyalkoxy)-2-hydroxy-4'-phenylbenzophenones as stabilizers against ultraviolet light. Piller, Bernhard; Duennenberger, Max; Bland, Hans R.; Luetth, Christian (Ciba Geigy A.-G.) *Ger. Offen.* 2,109,703 (Cl. C