teriostatic properties and were resistant to aging under uv light. CPJR

3217r Copolymerization of divinyl adipate with methyl acrylate studied by polarography. A. M. Shur, M. M. Filimonova, and B. F. Filimonov (Kishinevsk. Gos. Univ., Kishinev). *Vysokomol. Soedin., Ser. A* 9(10), 2193–7(1967)(Russ). In 0.05*M* Et_4NOH, as base electrolyte, divinyl adipate (I) (M_1) is hydrolyzed to AcH. The height of the polarographic wave (λ) due to AcH is proportional to I concn. In 0.05*M* Et_4NOH, Me acrylate (II) (M_2) has a polarographic halfwave potential of −1.88 v.; λ height gradually decreases (Brdicka and Wiesner, *CA* 41: 5403d). However, in 0.05*M* Et_4NI II has a const. λ, which depends only on II concn. This difference in polarographic behavior of I and II was used to develop a sensitive anal. procedure for their detn. in the presence of each other. Copolymn. of I and II in sealed glass ampuls at 60° was carried out as described earlier (*CA* 56: 10385h). Samples were withdrawn and their I and II contents were detd. by polarography of aliquots in 0.05*M* Et_4NOH (for I) and 0.05*M* Et_4NI (for II). Kinetic curves were constructed and monomer reactivity ratios were found: $r_1 = 0.1 \pm 0.1$, $r_2 = 4 \pm 1$; on the basis of reactivity per double bond, $r_1' = 0.05 \pm 0.05$, $r_2' = 8 \pm 2$. CPJR

3218s Free-radical polymerization of ethylene. VII. Effect of pressure on copolymerization of ethylene with vinyl chloride. F. I. Duntov, A. L. Gol'denberg, M. A. Litvinova, and B. L. Erusalimskii. *Vysokomol. Soedin., Ser. A* 9(9), 1920–3(1967)(Russ); cf. *CA* 63: 10070b. The influence of the pressure on reaction rate and the monomer relative reactivities in the copolymn. of ethylene and vinyl chloride in the presence of azoisobutyronitrile at 300–1500 atm. was studied. The study used 2 compns.: 13–17% and 43–61 mole % vinyl chloride. In both cases, the copolymn. rate increases with increasing pressure, and the increase is more pronounced at higher ethylene content. Curves showing the dependence of copolymn. rate on pressure and on compn. are given, and reactivity ratios are 0.10 and 1.85 for ethylene and vinyl chloride at 300 atm., and 0.2 and 1.85 at 1500 atm., resp. Ir spectra are given for the copolymers, and bands are present at 833, 770, 752, 726, and 722 cm.$^{-1}$ Approx. 20% $-CH_2CHCl(CH_2)_2CHClCH_2-$ is present in the copolymer. BRJR

3219t The crystallization of ethyl- and methyl-branched copolymers of polyethylene from dilute solution. P. J. Holdsworth and A. Keller (Univ. Bristol, Engl.). *J. Polym. Sci., Part B* 5(8), 605–12(1967)(Eng). The morphology of crystals was studied for both ethylene–propylene (I) and ethylene–1-butene (II) copolymers grown from 0.1% soln. I contained 8.4 and 27.9 Me-branches/1000 C-atoms and II had 11 and 31.4 Et-branches/1000 C-atoms. Mats of the crystals were annealed and their crystallinity was detd. by heat of fusion. Varying lamellar thickness with appropriate crystn. and annealing conditions caused no tendency for the branches to be ejected from the lattice. Both I and II were crystd. as chain-folded lamellae, within which the branches were accommodated, producing less regular crystal habits and less perfect chain packing than for the homopolymer. When allowance was made for differences in m.p., the variations of lamellar thickness with crystn. and annealing temps. and with solvent followed the trends established for linear polyethylene. BZJN

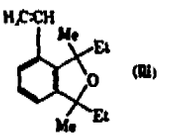
3220m Polymerization in an electric field. Norio Ise (Kyoto Univ., Kyoto, Japan). *Kyoto Daigaku Nippon Kagakuseni Kenkyusho Koenshu* 1966(23), 47–56(Japan). Styrene (I), α-methylstyrene (II), iso-Bu vinyl ether (III), or *p*-methoxystyrene (IV) was polymd. by I_2 in 1,2-$Cl_2C_2H_4$ in an elec. field to give the following results (monomer, R_{PE}/R_{PO}, and P_E/P_O given): I, 1.0, 1.0; II, 1.25; 1.05, III, 1.28, 1.04; IV, 1.34, 1.8; where R_{PE} and (or) P_E are polymerization rate and d.p., resp., in an elec. field (1 kv./cm.) and R_{PO} and P_O are polymn. rate and d.p., resp., under standard conditions. The elec. field did not affect the rate and degree of radical polymn. with Bz_2O_2 as catalyst. R_{PE}/R_{PO} is const. with varied elec. field. The author suggests that the initial step is formation of an ion pair of monomer and catalyst and that the ion pair is equilibrated with free ions. The mechanism is discussed. I. Tabushi

3221n Autocatalytic character of the thermal degradation of poly(vinyl chloride). L. S. Troitskaya, V. N. Myakov, B. B. Troitskii, and G. A. Razuvaev. *Vysokomol. Soedin., Ser. A* 9(10), 2119–25(1967)(Russ). Poly(vinyl chloride) thermal degradation dependence on pressure of HCl and the catalyst including org. acids, alcs., and phenols was studied. The HCl pressure at 179° and pressures of 60–605 mm. was studied, and the effect is given by the relation $dx/dt = dx_0/dt = kx_0^m p^n$ where dx/dt is the sum of the catalytic and noncatalytic rates, dx_0/dt is the rate of thermal degradation at 10^{-1}–10^{-2} mm., p is the HCl pressure, x is the amt. of HCl, x_0 is the amt. of HCl at 10^{-1}–10^{-2} mm., m and n are reaction order consts., and k is the reaction rate const. The consts. are given in the table. The uncatalyzed energy of activation for thermal degradation is 28 ± 1 kcal./mole, and the catalyzed energy of activation is 21 ± 1 kcal./mole. Curves showing the effect of org. acids at 180° including maleic anhydride, sebacic acid, $ClCH_2CO_2H$, stearic acid, lauric acid, azelaic acid, crotonic acid, adipic acid, and succinic acid show t the acids accelerate the rate of degradation. Phenols stud

Temp.	Pressure, mm.	m	n	k
175°	60	1.4	0.9	9.1×10^{-4}
	105	1.4		
	655	1.4		
	465	1.5		
180°	75	1.4	0.9	1.1×10^{-3}
	145	1.5		
	415	1.5		
	645	1.4		
185°	55	1.4	0.9	1.5×10^{-3}
	105	1.6		
	310	1.5		
	505	1.5		
190°	65	1.5	0.9	2.0×10^{-3}
	205	1.4		
	385	1.5		
	570	1.5		

show that the accelerating rates decrease in the order phe >2,4-di-*tert*-butylphenol >2,4,6-tri-*tert*-butylphenol. The me anism of the degradation was studied. The HCl attacks vici H and Cl to form double bonds and the alcs. and phenols atta labile Cl atoms. BRJR

3222p Styrene derivatives. VII. Polymerization of sor substituted 4-vinylphthalans. G. M. Pogosyan, A. A. Cho kyan, Al'b. A. Saakyan, and S. G. Matsoyan. *Vysokom Soedin., Ser. B* 9(5), 365–8(1967)(Russ). 1,3-Dimethyl-vinylphthalan (I), 1,1,3,3-tetramethyl-4-vinylphthalan (I 1,3-dimethyl-1,3-diethyl-4-vinylphthalan (III), and 1,3-bis(cyc



(III)

pentamethylene)-4-vinylphthalan (IV) were polymd. in bu or in a C_6H_6 soln. in the presence of Bz_2O_2 or azobisisobutyr nitrile. The polymn. rate increased with initiator concn. a with an increase of temp. from 80 to 100°. All the polyme formed were powderlike and sol. After 2 hrs. polymn., t yields were 13–19.5, 32–95, and 79–89% and the polymer softe ing temps. were 220–40, 300–20, and 270–95° for polymers of II, and III, resp. The yield of IV polymer (softening temp. 36 90°) was 68–82% within 9.5–32 hrs. Cf. *CA* 67: 116671g. BMJR

3223q Ultrasonic absorption in polymer solutions. Polystyrene in toluene. Hiroyasu Nomura and Yutaka Miy hara (Nagoya Univ., Nagoya, Japan). *Nippon Kagaku Zass* 88(5), 502–4(1967)(Japan). The ultrasonic absorption in soln of polystyrene in toluene was measured by a pulse-echo metho at 20 Mc./sec. In the plot of α/f^2 (α is the amplitude absorptio coeff. and f the frequency) vs. polymer concn., a break point wa observed which was shifted toward low concns. with increasin mol. wt. of the polystyrene. For concns. above the break point the α/f^2 vs. concn. curve was independent of the mol. wt. Th break point was ascribed to the onset of entanglement in th polymer soln. Yutaka Miyahara

3224r Radiation-induced solid-state polymerization of butane diol dimethacrylate. I. G. Gusakovskaya and V. I. Gol'dan skii. *Vysokomol. Soedin., Ser. B* 9(5), 390–2(1967)(Russ Within the exptl. error range, butanediol dimethacrylate (I did not polymerize at −196° under the effect of γ-irradn. Th was observed to be independent of the freezing rate of I. When prior to the irradn., I was frozen at 1°/min., the monome polymd. on subsequent melting in the m.p. region. At cooling rate of 600°/min., the polymn. occurred in 2 temp. re gions: at −107 to −85° (crystn. temp.) and at the m.p. BMJR

3225s Preparation and electrical properties of poly(tetra cyanoethylene copper chelate) film. Tunezo Naraba, Yoshihik Mizushima, Haruo Noake, Atsuo Nishioka, Yoshitaka Igarask Akira Imamura, and Yoshikazu Torihashi. *Rev. Elec. Commun Lab.* (Tokyo) 15(7–8), 551–62(1967)(En$_s$). Poly(tetracyanc ethylene Cu chelate) films were prepd. by heating tetracyanc ethylene and a Cu plate in a sealed, evacuated glass tube. Th max. yield of chelate was obtained at 400°. Yield increase rapidly with reaction time up to about 30 min., and then increase more slowly. The yield during the second stage of the reactio was linearly dependent on the sq. root of the time. The film formed on plates pretreated by high-frequency heating wer thinner than those formed on plates treated only by electr polishing, but films were obtained even on plates with a surf oxide layer. The film contained 24–8 wt. % Cu. Electro probe microanalysis showed the Cu concn. to be 30–0% at th base layer and 20% on the upper surface. The films showe p-type cond., with the activation energy for cond. varying fro 0.1 to 0.5 ev. Resistivity showed a marked anisotropy, wit space-charge-limited characteristics in the perpendicular dire tion. Heat treatment decreased the resistivity and space-charg cond. The dielec. const. and loss factor decreased with increa ing frequency. Other metals with electronegativity <1.9 an