## ETHERS (Continued)

**Ethers** for extractants, solvents, and inert reaction media.

**Glycol Diethers** for solvents, couplers, extractants, inert reaction media, and special fluids.

**Acetals** for solvents and chemical intermediates.

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. |
|---|---|---|---|
| Dimethyl Ether | $CH_3OCH_3$ | 46.07 | (d) |
| Ethyl Ether | $C_2H_5OC_2H_5$ | 74.12 | (d) |
| Isopropyl Ether | $(CH_3)_2CHOCH(CH_3)_2$ | 102.18 | (d) |
| Butyl Ether | $C_4H_9OC_4H_9$ | 130.23 | 99.7 |
| 1,3-Dioxolane | $OCH_2OCH_2CH_2$ | 64.08 | 99.9 |
| 1,4-Dioxane | $OCH_2CH_2OCH_2CH_2$ | 88.11 | (d) |
| Diethyl CARBITOL | $C_2H_5O[C_2H_4O]_2C_2H_5$ | 162.23 | 100 |
| Dibutyl CARBITOL | $C_4H_9O[C_2H_4O]_2C_4H_9$ | 218.34 | 98 |
| 2-Methoxy-3,4-Dihydro-2H-Pyran | $OCH{:}CHCH_2CH_2CHOCH_3$ | 114.15 | 98 |
| 1,1,3-Triethoxyhexane | $CH(OC_2H_5)_2CH_2CH(OC_2H_5)C_3H_7$ | 218.34 | 99.5 |
| 2-Methyl-2-Ethyl-1,3-Dioxolane | $(CH_3)(C_2H_5)COCH_2CH_2O$ | 116.16 | 99.7 |

## *FLEXOL* PLASTICIZERS

Useful for many vinyl applications —in film and sheeting, flooring, coated fabrics, wire and cable and other extrusions, organosols, plastisols, and plastigels. FLEXOL Plasticizers are also available for lacquers and for natural and synthetic rubber.

No one plasticizer can serve all needs, but FLEXOL DOP offers the best combination of properties. FLEXOL 10-10 and 13-13 offer improved permanence. FLEXOL TOF is outstanding in low-temperature applications. FLEXOL PEP is a primary epoxy plasticizer that does not support fungus growth. FLEXOL R-2H resists extractions and rub-off. FLEXOL 380 is preferred for its low-marring characteristics.

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. |
|---|---|---|---|
| **GENERAL PURPOSE PLASTICIZERS** | | | |
| FLEXOL Plasticizer DBP | $C_6H_4(COOC_4H_9)_2$ | 278.35 | (d) |
| FLEXOL Plasticizer 426 | $C_6H_4[COO(C_4H_9)x]$ $[COO(C_8H_{17})y]$ (b) | .... | (g) |
| FLEXOL Plasticizer DOP (h) | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 390.57 | (g) |
| FLEXOL Plasticizer DIOP | $C_6H_4(COOC_8H_{17})_2$ (mixed isomers) | 390.57 | (g) |
| FLEXOL Plasticizer 810 | $C_6H_4[COO(C_{10}H_{21})x]$ $[COO(CH_2CH[C_2H_5]C_4H_9)y]$ (b) | .... | (g) |
| FLEXOL Plasticizer 10-10 (i) | $C_6H_4(COOC_{10}H_{21})_2$ (mixed isomers) | 446.68 | (g) |
| FLEXOL Plasticizer 13-13 | $C_6H_4(COOC_{13}H_{27})$ (mixed isomers) | 530.84 | (g) |
| FLEXOL Plasticizer NHDP | *n*-Hexyl, *n*-Octyl, *n*-Decyl Phthalate | .... | (g) |
| FLEXOL Plasticizer NODP | *n*-Octyl, *n*-Decyl Phthalate | .... | (g) |
| FLEXOL Plasticizer 380 (i) | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 390.57 | (g) |
| **LOW-TEMPERATURE PLASTICIZERS** | | | |
| FLEXOL Plasticizer A-26 (i) | $C_4H_8[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 370.58 | (g) |
| FLEXOL Plasticizer 10-A | $C_4H_8(COOC_{10}H_{21})_2$ (mixed isomers) | 426.69 | (g) |
| FLEXOL Plasticizer TOF (k) | $[C_4H_9CH(C_2H_5)CH_2O]_3P{:}O$ | 434.65 | 99.6 |
| FLEXOL Plasticizer Z-88 | $C_7H_{14}[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 412.66 | (g) |
| **EPOXY PLASTICIZERS** | | | |
| FLEXOL Plasticizer EPO | Epoxidized Soybean Oil | 1000 (approx.) | 7.0, min., as oxirane |
| FLEXOL Plasticizer EP-8 (j) | Octyl Epoxytallate | .... | 5.0, min., as oxirane |
| FLEXOL Plasticizer GPE (j) | Epoxy Ester | .... | (g) |
| FLEXOL Plasticizer PEP | $O(C_4H_8)(COOC_{10}H_{21})_2$ | 466.61 | (g) |
| **SPECIAL PLASTICIZERS** | | | |
| FLEXOL Plasticizer 575 | .... | .... | (d) |
| FLEXOL Plasticizer R-2H | Polyester | 1850 | (g) |
| FLEXOL Plasticizer 3GH | $C_5H_{11}COOCH_2[CH_2OCH_2]_2CH_2OCOC_5H_{11}$ | 346.46 | (g) |
| FLEXOL Plasticizer 3GO | $C_7H_{15}COOCH_2[CH_2OCH_2]_2CH_2OCOC_7H_{15}$ | 402.58 | (g) |
| FLEXOL Plasticizer 4GO | $C_7H_{15}COOCH_2[CH_2OCH_2]xCH_2OCOC_7H_{15}$ | .... | (g) |

(a) All flash points below 175°F. were determined by ASTM method D 1310 using Tag open cup. All flash points above 175°F. were determined by ASTM method D 92 using Cleveland open cup.
(b) A mixed ester: X + Y = 2.
(c) Freezing point, °C.
(d) 99+ mol per cent material.

## SHIPPING DATA
Determined on typical commercial material

### ETHERS (Continued)

| Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 760 mm. | Vapor Pressure, mm. Hg at 20°C. | Freezing Point, °C. | Solubility, % by weight at 20°C. In Water | Water In | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U. S.) ICC Drum: Net Contents, Pounds | 55-Gal. (U. S.) ICC Drum: Type Drum—Type Lining (if any) (l) | ICC Labels Required |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.6668(e) | −24.7 | 3745 | −141.5 | 35.5(f) | .... | (SEE UCON PROPELLANTS, PAGE 26.) | | | | |
| 0.7144 | 34.5 | 439 | −116.3 | 6.9 | 1.3 | 5.95 | <0 | 321 | 17C | Red + Bung Label |
| 0.7245 | 68.5 | 118 | −85.5 | 1.2 | 0.57 | 6.03 | <0 | 327 | 17C | Red |
| 0.7700 | 142.0 | 5 | −95.4 | 0.03 | 0.19 | 6.41 | 92 | 352 | 17E | None |
| 1.0666 | 75.6 | 79 | −97.3 | Complete | | 8.88 | 56 | 480 | 17E-2X | Red |
| 1.0356 | 101.3 | 27 | −11.8 | Complete | | 8.60 | 74 | 473 | 17E | Red |
| 0.9082 | 189 | <1 | −44.3 | Complete | | 7.56 | 195 | 416 | 17E | None |
| 0.8853 | 256 | <1 | −60.2 | 0.3 | 1.4 | 7.36 | 245 | 407 | 17E | None |
| 0.9989 | 117.6 | 21.1 | <−80 | 0.3 | 0.4 | 8.31 | .... | 450 | 17E | None |
| 0.8746 | 133 (50 mm.) (f) | <0.1 | −100(g) | <0.01 | 0.59 | 7.29 | 210 | 400 | 17E | None |
| 0.9392 | 117.9 | 14 | −82.0 | 2.2 | 1.2 | 7.81 | 74 | 420 | 17E-2X | Red |

### FLEXOL PLASTICIZERS

| Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 5 mm. | Vapor Pressure, mm. Hg at 200°C. | Pour Point, °C. | Solubility, % by weight at 20°C. In Water | Water In | Viscosity, Centipoises, 20°C. | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U. S.) ICC Drum: Net Contents, Pounds | 55-Gal. (U. S.) ICC Drum: Type Drum—Type Lining (if any) (l) | ICC Labels Required |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.0478 | 335 (760 mm.) | $<0.01_{20°C.}$ | .... | <0.01 | 0.46 | 20 | 8.72 | 340 | 485 | 17E | None |
| 0.9941 | 224 | 1.8 | −37 | <0.01 | 0.4 | 60.7 | 8.27 | 410 | 460 | 17E | None |
| 0.9861 | 231 | 1.32 | −46 | <0.01 | 0.2 | 81.4 | 8.20 | 425 | 440 | 17E | None |
| 0.9853 | 236 | 1.0 | −46 | <0.01 | 0.2 | 71 | 8.21 | 425 | 440 | 17E | None |
| 0.9729 | 245 | 0.54 | −48 | <0.01 | 0.3 | 101 | 8.10 | 445 | 451 | 17E | None |
| 0.9675 | 261 | 0.3 | −37 | <0.01 | 0.2 | 113.2 | 8.05 | 445 | 448 | 17E | None |
| 0.9512 | 242 (2 mm.) | <0.01 | −37 | <0.01 | 0.1 | 289 | 7.92 | 460 | 441 | 17E | None |
| 0.9755 | .... | .... | .... | <0.01 | 0.2 | 42.8 | 8.13 | 440 | 452 | 17E | None |
| 0.9725 | .... | .... | .... | <0.01 | 0.2 | 43.3 | 8.10 | 440 | 451 | 17E | None |
| 0.9840 | 241 | 0.69 | −46 | <0.01 | 0.1 | 86 | 8.18 | 450 | 455 | 17E | None |
| 0.9268 | 214 | 2.4 | −75 | <0.01 | 0.1 | 13.7 | 7.71 | 385 | 428 | 17E | None |
| 0.9181 | 245 | 0.58 | −84 | <0.01 | 0.1 | 26.3 | 7.65 | 425 | 425 | 17E | None |
| 0.9260 | 220 | 1.9 | −74 | <0.01 | 1.6 | 14.1 | 7.70 | 405 | 428 | 17E | None |
| 0.918 | 237 | .... | −76 | <0.01 | .... | .... | 7.64 | 415 | 424 | 17E-2X | None |
| 0.995, avg. | >150, Decomposes | Decomposes | −4 | $<0.01_{25°C.}$ | $0.55_{25°C.}$ | 516 | 8.26 | 600 | 450 | 17E | None |
| 0.9232 | >215, Decomposes | 0.3, Decomposes | −8.5(c) | <0.01 | 0.3 | 35.2 | 7.69 | 455 | 427 | 17E | None |
| 0.9310 | 240 | $<0.01_{20°C.}$ | −10(c) | $0.07_{25°C.}$ | $0.1_{25°C.}$ | $22.7_{25°C.}$ | 7.75 | 475 | 420 | 17E | None |
| 0.9867 | >200, Decomposes | 0.3 | −38.3 | <0.01 | 0.3 | 184 | 8.17 | 460 | 455 | 17E | None |
| 1.0641 | 172 (20 mm.) | <0.1 | −0.6 | $<0.01_{25°C.}$ | $0.8_{25°C}$ | 99 | 8.86 | 390 | 493 | 17E | None |
| 1.055 | .... | .... | 5 | <0.01 | 1 | 16,520 | 8.75 | 550 | 450 | R40 | None |
| 0.9946 | 196 | 6 | −65 | 0.02 | 1.0 | 12 | 8.27 | 385 | 449 | 17E | None |
| 0.9679 | 219 | 1.85 | −65 | <0.01 | 0.4 | 16 | 8.06 | 405 | 439 | 17E | None |
| 0.9892 | 218 | .... | −55 | <0.01 | 1.4 | 25.1 | 8.20 | 395 | 446 | 17E | None |

(e) For liquid at saturation pressure. True density, g. ml.
(f) For liquid at saturation pressure.
(g) Typical commercial material.
(h) Available also in food packaging and low odor grades.
(i) Available also in low odor grades.
(j) Also used as a low-temperature plasticizer.
(k) Also provides flame retarding to vinyl compositions.
(l) For Definition of Container Codes, see page 33.

## ETHERS (continued)

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. | Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 760 mm. | Vapor Pressure, mm. Hg. at 20°C. | Freezing Point, °C. | Solubility, % by weight at 20°C. In Water | Water In | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U. S.) DOT Drum: Net Contents, Pounds | 55-Gal. (U. S.) DOT Drum: Type Drum—Type Lining (If any) (b) | DOT Labels Required |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-Methoxy-3,4-Dihydro-2H-Pyran | $OCH{:}CHCH_2CH_2CHOCH_3$ | 114.15 | 98 | 0.9989 | 117.6 | 21.1 | <—80 | 0.3 | 0.4 | 8.31 | .... | 450 | 17E | None |
| 2-Ethoxy-3,4-Dihydro-2H-Pyran | $OCH{:}CHCH_2CH_2CHOC_2H_5$ | 128.17 | 99.2 | 0.8746 | 133 (50 mm.) (h) | <0.1 | —100(d) | <0.01 | 0.59 | 7.29 | 210 | 400 | 17E | None |
| 2-Methyl-2-Ethyl-1,3-Dioxolane▲ | $(CH_3)(C_2H_5)COCH_2CH_2O$ | 116.16 | 99.7 | 0.9392 | 117.9 | 14 | —82.0 | 2.2 | 1.2 | 7.81 | 74 | 429 | 17E-2 | Red |
| Diethoxy Tetraglycol★ | $C_2H_5O(C_2H_4O)_4C_2H_5$ | 250.34 | (c) | 0.9774 | 276.7 | <0.01 | —21 | Complete | | 8.13 | 300 | 449 | 17E | None |
| *alpha*-Methylbenzyl Ether | $C_6H_5CH(CH_3)OCH(CH_3)C_6H_5$ | 226.32 | 99.7 | 1.0025 | 286.4 | <0.01 | —30(d) | <0.01 | 0.22 | 8.34 | 275 | 463 | 17E (i) | None |

## FLEXOL® PLASTICIZERS

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. | Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 5 mm. | Vapor Pressure, mm. Hg at 200°C. | Pour Point, °C. | Solubility, % by weight at 20°C. In Water | Water In | Viscosity, Centipoises, 20°C. | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U. S.) DOT Drum: Net Contents, Pounds | 55-Gal. (U. S.) DOT Drum: Type Drum—Type Lining (If any) (b) | DOT Labels Required |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GENERAL PURPOSE PLASTICIZERS** | | | | | | | | | | | | | | | |
| FLEXOL Plasticizer DBP | $C_6H_4(COOC_4H_9)_2$ | 278.35 | (c) | 1.0478 | 335 (760 mm.) | <0.01 at 20°C. | .... | <0.01 | 0.46 | 20 | 8.72 | 340 | 485 | 17E | None |
| FLEXOL Plasticizer 426 | $C_6H_4[COO(C_4H_9)x]$ $[COO(C_8H_{17})y]$ (k) | .... | (e) | 0.9941 | 224 | 1.8 | —37 | <0.01 | 0.4 | 60.7 | 8.27 | 410 | 460 | 17E | None |
| FLEXOL Plasticizer DOP (j) | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 390.57 | (e) | 0.9861 | 231 | 1.32 | —46 | <0.01 | 0.2 | 81.4 | 8.20 | 425 | 455 | 17E | None |
| FLEXOL Plasticizer DIOP | $C_6H_4(COOC_8H_{17})_2$ (mixed isomers) | 390.57 | (e) | 0.9853 | 236 | 1.0 | —46 | <0.01 | 0.2 | 71 | 8.21 | 425 | 455 | 17E | None |
| FLEXOL Plasticizer 810 | $C_6H_4[COO(C_{10}H_{21})x]$ $[COO(CH_2CH[C_2H_5]C_4H_9)y]$ (k) | .... | (e) | 0.9729 | 245 | 0.54 | —48 | <0.01 | 0.3 | 101 | 8.10 | 445 | 451 | 17E | None |
| FLEXOL Plasticizer 10-10 (l) | $C_6H_4(COOC_{10}H_{21})_2$ (mixed isomers) | 446.68 | (e) | 0.9675 | 261 | 0.3 | —37 | <0.01 | 0.2 | 113.2 | 8.05 | 445 | 448 | 17E | None |
| FLEXOL Plasticizer 13-13 | $C_6H_4(COO_{13}CH_{27})$ (mixed isomers) | 530.84 | (e) | 0.9512 | 242 (2 mm.) | <0.01 | —37 | <0.01 | 0.1 | 289 | 7.92 | 460 | 441 | 17E | None |
| FLEXOL Plasticizer NHDP | *n*-Hexyl, *n*-Octyl, *n*-Decyl Phthalate | . . | (e) | 0.9755 | . . . | . . . | . . | <0.01 | 0.2 | 42.8 | 8.13 | 440 | 452 | 17E | None |
| FLEXOL Plasticizer NODP | *n*-Octyl, *n*-Decyl Phthalate | . . . | (e) | 0.9725 | . . | . . . | . . . . | <0.01 | 0.2 | 43.3 | 8.10 | 440 | 451 | 17E | None |
| FLEXOL Plasticizer 380 (l) | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 390.57 | (e) | 0.9840 | 241 | 0.69 | —46 | <0.01 | 0.1 | 86 | 8.18 | 450 | 455 | 17E | None |
| **LOW-TEMPERATURE PLASTICIZERS** | | | | | | | | | | | | | | | |
| FLEXOL Plasticizer A-26 (l) | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 370.58 | (e) | 0.9268 | 214 | 2.4 | —75 | <0.01 | 0.1 | 13.7 | 7.71 | 385 | 428 | 17E | None |
| FLEXOL Plasticizer 10-A | $C_6H_4(COOC_{10}H_{21})_2$ (mixed isomers) | 426.69 | (e) | 0.9181 | 245 | 0.58 | —84 | <0.01 | 0.1 | 26.3 | 7.65 | 425 | 425 | 17E | None |
| FLEXOL Plasticizer TOF (m) | $[C_4H_9CH(C_2H_5)CH_2O]_3P{:}O$ | 434.65 | 99.6 | 0.9260 | 220 | 1.9 | —74 | <0.01 | 1.6 | 14.1 | 7.70 | 405 | 428 | 17E | None |
| FLEXOL Plasticizer Z-88 | $C_7H_{14}[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 412.66 | (e) | 0.918 | 237 | .... | —76 | <0.01 | . . . | .... | 7.64 | 415 | 424 | 17E-2 | None |

(continued)

▲ Development chemical; not in commercial production. Drum quantities available on sufficient notice.

★ This product is produced periodically; therefore, availability is dependent on production schedules.

(a) All flash points below 175°F. were determined by ASTM method D 1310 using Tag open cup. All flash points above 175°F. were determined by ASTM method D 92 using Cleveland open cup.

(b) For Definitions of Container Codes, see page 86.

(c) 99+ mol per cent material.

(d) Sets to glass below this temperature.

(e) Typical commercial material.

(f) For liquid at saturation pressure. True density, g./ml.

(g) For liquid at saturation pressure.

(h) Decomposes at 760 mm.

(i) Asbestos gasket.

(j) Available also in food packaging grade.

(k) A mixed ester: X + Y = 2.

(l) Available also in low odor grades.

(m) Also provides flame retarding to vinyl compositions.

## ETHERS (continued)

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. | Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 760 mm. | Vapor Pressure, mm. Hg. at 20°C. | Freezing Point, °C. | Solubility, % by weight at 20°C. In Water | Water In | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U. S.) DOT Drum: Net Contents, Pounds | 55-Gal. (U. S.) DOT Drum: Type Drum—Type Lining (if any) (b) | DOT Labels Required |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-Ethoxy-3,4-Dihydro-2H-Pyran | $OCH{:}CHCH_2CH_2CHOC_2H_5$ | 128.17 | 99.2 | 0.8746 | 133 (50 mm.) (h) | <0.1 | —100(d) | <0.01 | 0.59 | 8.08 | 98 | 444 | 17E | None |
| 2-Methyl-2-Ethyl-1,3-Dioxolane▲ | $(CH_3)(C_2H_5)COCH_2CH_2O$ | 116.16 | 99.7 | 0.9392 | 117.9 | 14 | —82.0 | 2.2 | 1.2 | 7.81 | 74 | 429 | 17E-2 | Red |
| Diethoxy Tetraglycol★ | $C_2H_5O(C_2H_4O)_4C_2H_5$ | 250.34 | (c) | 0.9774 | 276.7 | <0.01 | —21 | Complete | | 8.13 | 300 | 449 | 17E | None |
| alpha-Methylbenzyl Ether★ | $C_6H_5CH(CH_3)OCH(CH_3)C_6H_5$ | 226.32 | 99.7 | 1.0025 | 286.4 | <0.01 | —30(d) | <0.01 | 0.22 | 8.34 | 275 | 463 | 17E (i) | None |

## FLEXOL® PLASTICIZERS

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. | Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 5 mm. | Vapor Pressure, mm. Hg at 200°C. | Pour Point, °C. | Solubility, % by weight at 20°C. In Water | Water In | Viscosity, Centipoises, 20°C. | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U. S.) DOT Drum: Net Contents, Pounds | 55-Gal. (U. S.) DOT Drum: Type Drum—Type Lining (if any) (b) | DOT Labels Required |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **GENERAL PURPOSE PLASTICIZERS** | | | | | | | | | | | | | | | |
| FLEXOL Plasticizer DBP | $C_6H_4(COOC_4H_9)_2$ | 278.35 | (c) | 1.0478 | 335 (760 mm.) | <0.01 at 20°C. | | <0.01 | 0.46 | 20 | 8.72 | 340 | 485 | 17E | None |
| FLEXOL Plasticizer 426 | $C_6H_4[COO(C_4H_9)x][COO(C_8H_{17})y]$ (k) | | (e) | 0.9941 | 224 | 1.8 | —37 | <0.01 | 0.4 | 60.7 | 8.27 | 410 | 460 | 17E | None |
| FLEXOL Plasticizer DOP (j) | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 390.57 | (e) | 0.9861 | 231 | 1.32 | —46 | <0.01 | 0.2 | 81.4 | 8.20 | 425 | 455 | 17E | None |
| FLEXOL Plasticizer DIOP | $C_6H_4(COOC_8H_{17})_2$ (mixed isomers) | 390.57 | (e) | 0.9853 | 236 | 1.0 | —46 | <0.01 | 0.2 | 71 | 8.21 | 425 | 455 | 17E | None |
| FLEXOL Plasticizer 810 | $C_6H_4[COO(C_{10}H_{21})x]_3$ $[COOCH_2CH(C_2H_5)C_4H_9)y]$ (k) | | (e) | 0.9729 | 245 | 0.54 | —48 | <0.01 | 0.3 | 101 | 8.10 | 445 | 451 | 17E | None |
| FLEXOL Plasticizer 10-10 (l) | $C_6H_4(COOC_{10}H_{21})_2$ (mixed isomers) | 446.68 | (e) | 0.9675 | 261 | 0.3 | —37 | <0.01 | 0.2 | 113.2 | 8.05 | 445 | 448 | 17E | None |
| FLEXOL Plasticizer 13-13 | $C_6H_4(COO_{13}CH_{27})$ (mixed isomers) | 530.84 | (e) | 0.9512 | 242 (2 mm.) | <0.01 | —37 | <0.01 | 0.1 | 289 | 7.92 | 460 | 441 | 17E | None |
| FLEXOL Plasticizer NHDP | *n*-Hexyl, *n*-Octyl, *n*-Decyl Phthalate | | (e) | 0.9755 | | | | <0.01 | 0.2 | 42.8 | 8.13 | 440 | 452 | 17E | None |
| FLEXOL Plasticizer NODP | *n*-Octyl, *n*-Decyl Phthalate | | (e) | 0.9725 | | | | <0.01 | 0.2 | 43.3 | 8.10 | 440 | 451 | 17E | None |
| FLEXOL Plasticizer 380 | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 390.57 | (e) | 0.9840 | 241 | 0.69 | —46 | <0.01 | 0.1 | 86 | 8.18 | 450 | 455 | 17E | None |
| **LOW-TEMPERATURE PLASTICIZERS** | | | | | | | | | | | | | | | |
| FLEXOL Plasticizer A-26 (l) | $C_6H_4[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 370.58 | (e) | 0.9268 | 214 | 2.4 | —75 | <0.01 | 0.1 | 13.7 | 7.71 | 385 | 428 | 17E | None |
| FLEXOL Plasticizer 10-A | $C_6H_4(COOC_{10}H_{21})_2$ (mixed isomers) | 426.69 | (e) | 0.9181 | 245 | 0.58 | —84 | <0.01 | 0.1 | 26.3 | 7.65 | 425 | 425 | 17E | None |
| FLEXOL Plasticizer TOF (m) | $[C_4H_9CH(C_2H_5)CH_2O]_3P{:}O$ | 434.65 | 99.6 | 0.9260 | 220 | 1.9 | —74 | <0.01 | 1.6 | 14.1 | 7.70 | 405 | 428 | 17E | None |
| FLEXOL Plasticizer Z-88 | $C_7H_{14}[COOCH_2CH(C_2H_5)C_4H_9]_2$ | 412.66 | (e) | 0.918 | 237 | | —76 | <0.01 | | | 7.64 | 415 | 424 | 17E | None |

(continued)

▲ Development chemical; not in commercial production. Drum quantities available on sufficient notice.

★ This product is produced periodically; therefore, availability is dependent on production schedules.

(a) All flash points below 175°F. were determined by ASTM method D 1310 using Tag open cup. All flash points above 175°F. were determined by ASTM method D 92 using Cleveland open cup.

(b) For Definitions of Container Codes, see page 70.

(c) 99+ mol per cent material.

(d) Sets to glass below this temperature.

(e) Typical commercial material.

(f) For liquid at saturation pressure. True density, g./ml.

(g) For liquid at saturation pressure.

(h) Decomposes at 760 mm.

(i) Asbestos gasket.

(j) Available also in food packaging grade.

(k) A mixed ester. X + Y = 2

(l) Available also in low odor grades.

(m) Also provides flame retarding to vinyl compositions.

## FLEXOL® PLASTICIZERS

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. | Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 5 mm. | Vapor Pressure, mm. Hg at 200°C. | Pour Point, °C. | Solubility, % by weight at 20°C. In Water | Solubility, % by weight at 20°C. Water In | Viscosity, Centipoises, 20°C. | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U.S.) DOT Drum: Net Contents, Pounds | 55-Gal. (U.S.) DOT Drum: Type Drum—Type Lining (if any) (b) | DOT Labels Required (b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LOW-TEMPERATURE PLASTICIZER** | | | | | | | | | | | | | | | |
| FLEXOL Plasticizer TOF (h) | $[C_4H_9CH(C_2H_5)CH_2O]_3P{:}O$ | 434.65 | 99.6 | 0.9260 | 220 | 1.9 | −74 | <0.01 | 1.6 | 14.1 | 7.70 | 346P | 428 | 17E | None |
| **EPOXY PLASTICIZERS** | | | | | | | | | | | | | | | |
| FLEXOL Plasticizer EPO | Epoxidized Soybean Oil | 1000 (approx.) | 7.0, min., as oxirane | 0.9925 | >150, Decomposes | Decomposes | −2 | $<0.01_{25°C.}$ | $0.66_{25°C.}$ | 518 | 8.26 | 314 | 450 | 17E | None |
| FLEXOL Plasticizer EP-8(i) | Octyl Epoxytallate | 420 (approx.) | 5.0, min., as oxirane | 0.9241 | >215, Decomposes | 0.3 Decomposes | −8.5(j) | <0.01 | 0.3 | 35.2 | 7.69 | 380 | 427 | 17E | None |
| FLEXOL Plasticizer LOE | Epoxidized Linseed Oil | .... | 9.0, min., as oxirane | 1.030 | >280, Decomposes | <0.1 | (f) | $<0.015_{25°C.}$ | $<0.017_{25°C.}$ | 700 | $8.55_{30°C.}$ | 461P | 472 | 17E | None |
| **SPECIAL PLASTICIZERS** | | | | | | | | | | | | | | | |
| FLEXOL Plasticizer 3GH | $C_5H_{11}COOCH_2[CH_2OCH_2]_2CH_2OCOC_5H_{11}$ | 346.46 | (e) | 0.9946 | 196 | 6 | −65 | 0.02 | 1.0 | 12 | 8.27 | 385C | 449 | 17E | None |
| FLEXOL Plasticizer 4GO | $C_7H_{15}COOCH_2[CH_2OCH_2]_3CH_2OCOC_7H_{15}$ | .... | (e) | 0.9892 | 218 | .... | −55 | <0.01 | 1.4 | 25.1 | 8.20 | 395C | 446 | 17E | None |

## GLYCOL ETHERS

| Product | Formula | Formula Molecular Weight | Purity of Tested Sample, % by wt. | Apparent Specific Gravity, 20/20°C. | Boiling Point, °C., 760 mm. | Vapor Pressure, mm. Hg at 20° C. | Freezing Point, °C. | Solubility, % by weight at 20°C. In Water | Solubility, % by weight at 20°C. Water In | Pounds Per Gal. at 20°C. | Flash Point, °F. (a) | 55-Gal. (U.S.) DOT Drum: Net Contents, Pounds | 55-Gal. (U.S.) DOT Drum: Type Drum—Type Lining (if any) (b) | DOT Labels Required (b) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Methyl CELLOSOLVE | $CH_3OC_2H_4OH$ | 76.10 | 99 | 0.9663 | 124.5 | 6 | −85.1 | Complete | | 8.04 | 103 | 445 | 17E | None (k) |
| CELLOSOLVE Solvent | $C_2H_5OC_2H_4OH$ | 90.12 | 99 | 0.9311 | 135.6 | 4 | −100(d) | Complete | | 7.74 | 108 | 427 | 17E | None (k) |
| Butyl CELLOSOLVE | $C_4H_9OC_2H_4OH$ | 118.18 | 99 | 0.9019 | 171.2 | 0.6 | −70.4 | Complete | | 7.51 | 140 | 415 | 17E | None (k) |
| Hexyl CELLOSOLVE | $C_6H_{13}OCH_2CH_2OH$ | 146.23 | 99.8 | 0.8887 | 208.1 | <0.1 | −50.1 | 0.99 | 18.8 | 7.40 | 179 | 410 | 17E | None (k) |
| Methyl CARBITOL | $CH_3O[C_2H_4O]_2H$ | 120.15 | 99 | 1.0211 | 194.0 | <0.1 | −85(d) | Complete | | 8.51 | 188 | 472 | 17E | None (k) |
| CARBITOL Solvent LG | $C_2H_5O[C_2H_4O]_2H$ | 134.17 | 97 | 0.9914 | .... | .... | −100 | Complete | | 8.25 | 182 | 456 | 17E | None (k) |
| CARBITOL Solvent | $C_2H_5O[C_2H_4O]_2H$ | .... | (e) | 1.0273 | 195.0 | 0.05 | (l) | Complete | | 8.55 | 204 | 473 | 17E | None |
| Butyl CARBITOL | $C_4H_9O[C_2H_4O]_2H$ | 162.23 | 99 | 0.9536 | 230.6 | <0.1 | −68.1 | Complete | | 7.94 | 214 | 440 | 17E | None |
| Hexyl CARBITOL | $C_6H_{13}O[C_2H_4O]_2H$ | 190.28 | 99.3 | 0.9346 | 259.1 | <0.01 | −40.2 | 1.7 | 56.3 | 7.78 | 231P | 432 | 17E | None |
| PROPASOL Solvent B | $C_4H_9OCH_2CH(CH_3)OH$ | 132.20 | (e) | 0.8801 | 170.2 | 0.6 | −80(d) | 6.4 | 15.5 | 7.32 | 138 | 404 | 17E | None (k) |
| PROPASOL Solvent P | $C_3H_7OCH_2CH(CH_3)OH$ | 116.18 | (e) | 0.8865 | 149.8 | 1.7 | −60(d) | Complete | | 7.36 | 119 | 405 | 17E | None (k) |
| PROPASOL Solvent M | $CH_3OCH_2CH(CH_3)OH$ | 90.12 | 97.5 | 0.9234 | 121 | 8 | −95(d) | Complete | | 7.69 | 91 | 424 | 17E | FL |
| PROPASOL Solvent DM | $CH_3O[CH_2CH(CH_3)O]_2H$ | 148.20 | (e) | 0.9608 | 187.2 | <0.1 | −80(d) | Complete | | 8.00 | 167 | 442 | 17E | None (k) |

(continued)

A Development chemical; not in commercial production. Drum quantities available on sufficient notice.

(a) Unless otherwise specified with a letter-suffix, flash point was determined by ASTM method D 56 using Tag closed cup. Flash point suffixes indicate the following: "C" = determined by ASTM method D 92 using Cleveland open cup; "T" = determined by ASTM method D 1310 using Tag open cup; "P" = determined by ASTM method D 93 using Pensky-Martens closed cup.

(b) For Definitions of Container Codes and DOT Labels Required, see page 80.

(c) 99+ mol per cent material.

(d) Sets to glass below this temperature.

(e) Typical commercial material.

(f) Pour point, 27°F.

(g) Decomposes at 760 mm.

(h) Also provides flame retarding to vinyl compositions.

(i) Also used as a low-temperature plasticizer.

(j) Freezing point, °C.

(k) Shipments in bulk containers exceeding 110 gallons capacity are classified by the DOT as: Combustible Liquid, NOS (Combustible Liquid).

(l) Pour point, <−100° F.