# CEC carboxylated ethylene copolymer

| PARAMETER | UNIT | VALUE | REFERENCES |
|---|---|---|---|
| **GENERAL** | | | |
| **Common name** | - | carboxylated ethylene copolymer (ionomer), poly(ethylene-co-acrylic acid) | Laney, K A, B.Sc. Thesis, Princeton Uni., 2010. |
| **Acronym** | - | CEC | |
| **CAS number** | - | 187410-30-6; 9078-96-0 | |
| | | | |
| **HISTORY** | | | |
| **Person to discover** | - | Armitage, J B of DuPont | |
| **Date** | - | 1961 | |
| | | | |
| **SYNTHESIS** | | | |
| **Monomer(s) structure** | - | $CH_2$=$CH_2$; $CH_2$=C($CH_3$)COOH | |
| **Monomer(s) CAS number(s)** | - | 74-85-1; 79-41-4 | |
| **Monomer(s) molecular weight(s)** | dalton, g/mol, amu | 28.05; 86.06 | |
| **Methacrylic acid content** | % | usually <15 mol% (range 5-70 wt%) | |
| **Method of synthesis** | - | copolymers are produced by high-temperature/high pressure free radical polymerization similar to the one used in production of LDPE. Carboxyl groups are completely or partially neutralized to form ionomers (mostly Na or Zn). Neutralization extent increase causes adequate increase in viscosity of material | |
| **Polydispersity, $M_w/M_n$** | - | 10 | |
| **Degree of branching** | | 2/100 carbons (short chain), 1/1000 carbons (long chain) | |
| | | | |
| **STRUCTURE** | | | |
| **Crystallinity** | % | 30 | |
| | | | |
| **COMMERCIAL POLYMERS** | | | |
| **Some manufacturers** | - | DuPont | |
| **Trade names** | - | Surlyn | |
| | | | |
| **PHYSICAL PROPERTIES** | | | |
| **Density at 20°C** | g $cm^{-3}$ | 0.94-0.97; 1.01 (crystalline) | |
| **Melting point** | °C | 70-100 | |
| **Freeze point** | °C | 36-75 | |
| **Refractive index, 20°C** | - | 1.49 | |
| **Haze** | % | 3-7 | |
| **Thermal expansion coefficient, 23-80°C** | $°C^{-1}$ | 6E-5 | |
| **Heat of fusion** | kJ $mol^{-1}$ | 2.32 | |
| **Melt flow index** | g 10 $min^{-1}$ | 0.7-20 | |
| **Dielectric constant at 100 Hz/1 MHz** | - | 3.8/ | |
| | | | |

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| **MECHANICAL & RHEOLOGICAL PROPERTIES** | | | |
| **Tensile strength** | MPa | 15.8-37.2 | |
| **Elongation at break** | % | 285-770 | |
| **Hardness** | Shore D | 36-68 | |
| **Water absorption, equilibrium in water at 23°C** | % | 11-19 | |
| | | | |
| **PROCESSING** | | | |
| **Typical processing methods** | - | extrusion | |
| **Applications** | - | film, laminate, adhesive accelerator | |
| | | | |
| **BLENDS** | | | |
| **Suitable polymers** | - | EOP, HDPE, LDPE, LLDPE | Besser, K D; Gereke, J; Haubler, L; Leitner, B; Rapthel, I, US Patent, 2011/0077356, Dow, Mar. 31, 2001. |
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