B.4.5. Nouveaux polymères à base de polyoléfines pour câbles BT et MT

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B.4.5. New Polyolefin polymers for low and medium voltage power cables

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RESUME

De nouveaux copolymères éthylène-octène combinent les caractéristiques d'un produit ayant une distribution de poids moléculaire étroite, une bonne extrudabilité et de bonnes performances d'utilisation finales pour toute une gamme d'applications incluant le câble et les élastomères.
Ces macromolécules, produites au moyen de la technologie de catalyseurs à site unique avec géométrie sous tension, ont des caractéristiques remarquables: des bénéfices déterminants pour ce qui concerne la morphologie, ainsi que des propriétés mécaniques et une processabilité supèrieures, ont été mis en évidence, notamment par rapport à des produits tels que les caoutchoucs éthylène-propylène copolymères ou terpolymères (EPDM et EPR), ou même sous un angle plus spécifique, par rapport aux polyéthylènes basse densité (PEBD) et linéaires basse densité ou très basse densité (LLDPE et VLDPE).
Les polymères fabriqués au moyen de cette technologie peuvent offrir de nouvelles solutions pour l'isolation basse tension et moyenne tension, avec tous les procédés courants de transformation comme les réticulations par voie peroxide, silane ou irradiation.

ABSTRACT

New ethylene-octene copolymers combine the characteristics of narrow molecular weight distribution, good processability and good end-use performance for a variety of rubber and plastic applications including wire and cable insulation. These polymers produced via Constrained Geometry Single Site Catalyst Technology (CGCT) have unique features in terms of morphology, superior mechanical properties and processability. They have demonstrated many benefits, specially when compared to ethylene propylene rubbers (EPM and EPDM), and versus semi-rigid insulation applications where low density polyethylene (LDPE), linear low density polyethylene and linear very low density polyethylene (LLDPE and VLDPE) are used.
Polymers made with this technology can offer new technical solutions for low voltage and medium voltage applications, with a wide array of crosslinking techniques including peroxide, silane and irradiation.

INTRODUCTION

Many advancements have been made in olefin polymerization catalyst technology over the past twenty years. Polymers produced with single-site or metallocene catalyst technology are homogeneous polyolefin copolymers which provide improved properties over polymers prepared with conventional Ziegler-Natta heterogeneous catalysts. However, these types of polymers generally have processing deficiencies such as high processing melt viscosities and lower melt strength as compared to broad distribution polymers. Until recently, these processing deficiencies were corrected by blending of other polymers, use of a termonomer, or using processing aids. However, these modifications generally compromise the improved properties offered by the linear homogeneous polymer [1].
The development of a new catalyst and process technology, known as Constrained Geometry Single Site Catalyst Technology (CGCT), has now redefined processability for narrow composition distribution polyolefins.
This proprietary single-site catalyst technology provides the unique ability to produce linear polymers, via constrained geometry catalysis, which incorporate long chain branches and provide improved processing. Polymers produced with this novel technology were recognized with two recently issued composition of matter patents [2,3]. Furthermore, this Constrained Geometry Single Site Catalyst Technology can be used in a variety of processes (solution, high pressure, gas phase, and slurry) and can copolymerize ethylene with a wide range of monomers, thus giving broad process and product capability [4].

Polymers produced via Constrained Geometry Single Site Catalyst Technology (CGCT) allow the polymer engineer to better and more quickly design products to meet the performance requirements for an application. The single site of the constrained geometry catalyst has a single reactivity ratio for each monomer at a given set of reactor conditions. This contrasts with the heterogeneous Ziegler-Natta catalyst which contains multiple active polymerization sites and thus makes a polymer containing a mixture of molecular weights and comonomer distributions [5]. Therefore, this catalyst technology offers the capability of molecular architecture control which delivers accuracy of modeling, performance based design, speed-to-market, and ultimately successful polymer utility in a given application. With a customer's end-use performance requirements, coupled with an understanding of compound additives and process capabilities, a polymer structure can be hypothesized, modeled and a polymer produced within a very short time span to significantly reduce the product development cycle [6,7].

Purpose of the paper

The features of the polymers made with Constrained Geometry Single Site Catalyst Technology (CGCT) are described. They are demonstrated to translate into benefits for flexible and semi-rigid power cable insulation applications where EPDM / EPM, or LDPE and VLDPE are the current raw materials offered.