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# ABSTRACT BOOK

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## **DSL280**

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### **Irradiation of Pseudoboehmite-Polypropilene Nanocomposites**

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Polymeric nanocomposites are hybrid materials, where inorganic nanoscale dimensions substances are dispersed in a polymeric matrix. The fillers have high surface area, promoting better dispersion in the polymeric matrix and therefore an improvement in physical properties of the composite depending on the homogeneity of the material. The preparation of Nano composites polymer matrix allows in many cases to find a relationship between a low cost due to the use of a lower amount of charge, and a high level of performance. In the present work, nanocomposites of polypropylene with different concentrations of pseudoboehmite obtained by sol-gel process, and treated with octadecylamine were prepared. After preparation, the samples were irradiated with a 0, 50, 100, 200 e 300kGy radiation dose in an electron accelerator. The pseudoboehmite nanoparticles were characterized by X-ray diffraction, scanning electron microscopy, differential thermal analysis and thermo gravimetric analysis. The nanocomposites were characterized by thermal and mechanical tests. The addition of pseudoboehmite promoted a reduction of the melting flow during the production of the composites evidencing the interaction of pseudoboehmite with the polymeric matrix. Due to the polypropilene be a semicrystalline polymer, when exposed to the irradiation process, have their morphology modified due to scission mechanisms of the polymer chains.

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## **DSL307**

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### **Improved Piezoresistive Sensitivity in Polyisoprene Nanostructured Carbon Allotrope Hybrid Composites**

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In previous studies we have reported that piezoresistive effect in polyisoprene electrically conductive filler composites is highly dependent on filler concentrations, dispersion efficiency and filler geometry. In this study polyisoprene nanostructured carbon allotrope hybrid composites have been elaborated using various ratios and concentrations of multiwall carbon nanotubes (outer diameter 50-80nm, length 0,5-2  $\mu\text{m}$ , surface area 40  $\text{m}^2/\text{g}$ ) and electrically extra conductive high structure carbon blacks (average particle diameter 30nm, surface area 950  $\text{m}^2/\text{g}$ ). The piezoresistive effects of the hybrid composites have been tested under 1 and 10 atmospheres of external pressure in cyclic loading/unloading regime using Zwick/Roell Z2.5 universal material testing machine, coupled and synchronized with Agilent A34970A digital multimeter/multiplexer. It has been observed, that composite with certain filler concentrations and ratios has a significantly higher piezoresistive sensitivity compared to polyisoprene carbon nanotube composites or polyisoprene carbon black composites. Based on these results the impact of the synergy of both carbon nanotubes and carbon black at different concentrations on the polyisoprene nanostructured carbon allotrope hybrid composites piezoresistive properties have been evaluated and improved piezoresistive sensitivity is discussed.

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**DSL363**

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### **Synthesis and Characterization of Polymer Nanocomposites Containing Fe- 40 At.% Si Powder Particles**

#### **Prepared by High Energy Ball Mill.**

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Fe-Si alloys are widely used as transformer magnets and magnetic cores because of their excellent soft magnetic properties. Fe<sub>60</sub>Si<sub>40</sub> powders have milled in a high energy planetary ball mill (Retsch PM400) under argon atmosphere at different time of milling. The metal powders obtained have average diameter  $d_{50}$  of 2.5 to 6  $\mu\text{m}$ . The introduction of Si into Fe can result in a decrease of magnetic anisotropy (therefore leading to decrease of coercivity). The Nanocomposite magnetic cores were made from the Fe<sub>60</sub>Si<sub>40</sub> powder obtained by high energy ball milling for different milling time. The powders particles were mixed with unsaturated polyester (UP) to obtain toroidal cores. Polymerization process was made under magnetic field  $H = 500 \text{ A/m}$ , and ensured a preferential orientation of a powder particles.

Influences of the metallic powder fraction on soft magnetic properties as well as thermal increase under isothermal conditions were investigated along with the possibility to control these properties with the size and amount of powder fraction.

It was also found that the soft magnetic properties of the polymer composites can be controlled in a wide range and depends on mass fraction of the metallic powder Fe<sub>60</sub>Si<sub>40</sub> in the composite, on shape and size of the powder particles and their orientation in composite.