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FABRICATION AND CHARACTERIZATION OF METAL-CORE CARBON-SHELL NANOPARTICLES REINFORCED EPOXY RESIN NANOCOMPOSITES

Aldobenedetto Zotti[(1)], Simona Zuppolini[(1)], Anatolii Pomogailo[(2)], Gulzhian Dzhardimalieva[(2)], Vitaly Shershnev[(2)], Mauro Zarrelli[(1)], Anna Borriello[(1)]

[(1)]National Research Council of Italy, Italy
ben.zotti@hotmail.it, simona.zuppolini@unina.it, mauro.zarrelli@cnr.it, borriell@unina.it
[(2)]Russian Academy of Sciences, Russian Federation
adpomog@icp.ac.ru, dzhardim@icp.ac.ru, mrfemtos@gmail.com

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Summary: Nanoparticles have obtained a great deal of attention during last years because their physical properties often differ from those of the corresponding bulk material. In particular metal and metal oxide nanoparticles exhibit unique properties in regard to sorption behaviors, magnetic activity, chemical reduction among others. Magnetic particles, consisting of magnetic elements such as iron, cobalt, nickel and their corresponding oxides have been the focus of research due to their attractive physicochemical properties.
In this work, magnetic nanoparticles were prepared starting from acrylamide complex of metal nitrates (the used metals are Fe and Ni). A controlled thermolysis at constant temperature was carried out in a self-generated atmosphere with the final size of the particles determined by the temperature and the time of thermolysis. A bisphenol A-based epoxy resin was considered as matrix to realize nanocomposite at different nanoparticles loading contents. The mechanical, magnetical and thermal properties of the neat system and filled nanocomposites were investigated to study the effect of thermolysed nanoparticles.
The mechanical performance of the filled system show an increase of the fracture toughness according to the level of loading and the typology of nanoparticles, whereas negligible changes in thermal stability where recorded by experimental tests.
Magnetical results reveal that, at room temperature, the saturation magnetization and coercitivity vary according to the iron core diameter, which depends in turn by the preparation procedure of the nanoparticles.