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Functional nanocomposites based on silicon carbide nanoparticles: Selected insights on electronic and optical features

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Abstract

Nanostructured materials based on the wide band gap semiconductor Silicon Carbide (SiC) nanoparticles as isolated objects, embedded in polymer matrixes or functionalized by thin layer (~2nm) of conducting polymers were realized. The physical properties of several nanomaterials and nancomposites were investigated including electrical, dielectric, optical and electro-optical features. As isolated nano-objects, SiC nanoparticles exhibit modulated dielectric functions dependant on the particle sizes, on their surface states and on the involved crystalline order. The Electro-optical properties are marked by enhanced Pockels parameters due to polymer-nanoparticle interfaces effects. Alternatively, bare SiC nanoparticles under suitable annealing or hybrid core-shell functionalization of the nanoparticle surfaces are marked by enhanced electrical conductivities of the network associated to good thermo-mechanical behaviour. The physical origin of the dielectric and electrical conductivity in these nanomaterials is discussed based on the Havriliak-Negami model and the dynamics of polarons in the hybrid nanocomposites.

Biography

Prof.dr.hab.Abdel Hadi Kassiba was graduated from Caen University (Ph.D – French CNRS award in 1986) in Physics of Matter and Radiation and Habilitation from Maine University in Le Mans (France) for spectroscopic investigations of Incommensurate phase transitions in condensed Matter and EPR spectroscopy.

Abdel Hadi Kassiba is a Senior Researcher in the Institute of Le Mans Molecules and Materials (IMMM) affiliated to the French National Centre of Scientific Research CNRS (UMR-6283). The Main research areas are devoted to Physics of Nanomaterials, Nanocomposites for electronics, nonlinear Optics and Electrooptics, Functional mesoscopic materials for optical applications of wide band gap semiconductors such Silicon carbide and Titanium dioxide.

A.Kassiba is author and co-author of about 100 scientific contributions with major peer review articles and refereed proceedings of conference, contributions in 3 books and gives about 20 Invited International conferences, 30 Oral presentations and seminars in international conferences and ensure several Chairman sessions in International conferences (Morocco, Poland, Tunisia, Romania, France, Mexico, China); Supervisor of the works of 30 Master and PhD students.

A.Kassiba was awarded Best Scientific Paper in Nanotechnologies and advanced Materials “Arab Science and technologies fondation” (SRO5- Fès Morocco 2008) , Best invited conference talk (ICHMS Yalta 2009), Title of “Chevalier” of Palmes Academiques 2010 (Minestery of National Education - France), Title of Honorary Professor in Czestochowa-University Poland 2010 and Nominated as “Senior International Researcher” by China Academy of Science (CAS) 2011 for scientific cooperation with Shanghai institute of Ceramics (SIC-CAS), Invited International researcher in CINVESTAV Mexico 2012.