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"Induced magnetism in carbon-based and non-traditional inorganic materials"

Dr. A.N. Andriotis

Institute of Electronic Structure and Laser,
Foundation for Research and Technology-Hellas,
Heraklio, Crete, Greece

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Induced magnetism in carbon-based and non-traditional inorganic materials

A. N. Andriotis

Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas, P.O. Box 1527, Heraklio, Crete, Greece 71110
e-mail: andriot@iesl.forth.gr URL: http://esperia.iesl.forth.gr/~andriot

Abstract

The induced magnetism in traditionally non-magnetic materials opens new horizons in materials science with significant technological implications. A particular class of materials in which induced magnetism has been observed includes carbon-based (C-based) materials and non-traditional inorganic materials, the latter including the dilute magnetic semiconductors (DMSs). Recent studies have converged to the conclusion that the induced magnetism in these materials can be attributed to structural and topological defects as well as to doping. In a series of recent reports, we have proposed that the induced magnetism in C_{60}-based materials can be attributed to the simultaneous presence of two types of defects; namely the carbon-vacancies and the 2+2 cyclo-addition bonds which can act as donor and acceptor sites in a way analogous to that of McConnell II magnets. Our preliminary studies indicate that the same explanation can be given to the observed magnetism of the Co-doped ZnO giving credence to the claim that, in addition to the substitutional Co-impurities, the magnetic phase of the doped ZnO can be stabilized (enhanced) if another kind of defects (Zn-vacancy or substitutional Cu^+ impurities) are simultaneously present acting as donors and acceptors, respectively. In view of these results, investigations are carried out using computer simulations to see if one can optimize the magnetic features of these materials by appropriately choosing the type of defect and/or the dopants. Results on recent simulations for doped C_{60}-based polymers and doped ZnO will be presented and the possibility for tailoring their magnetic features will be discussed.

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