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Investigations on the magnetic properties of RF-based carbon aerogels loaded with nanosized magnetite

Carbon aerogels (CA) are very promising candidates for electrochemical applications, such as electrodes for energy storage systems (supercapacitors) or separation processes, because of their highly porous structure in combination with a high specific surface area and their excellent electrical conductivity. Functionalization of these CAs with nanoparticles (e.g. magnetite, silicon, metals), which are covalently bonded or trapped in the network may open new opportunities due to additional properties, just as magnetism, catalytic or electrochemical activity. Numerous organic monomers can serve as polymerizable precursors for the formation of wet gels that can be supercritically dried and subsequently carbonized under an inert atmosphere. For the structural nano-design of CAs templating approaches are available, namely by use of silica, polymers or metals and a subsequent etching process. In our study, we use diluted resorcinol-formaldehyde (RF) in water as sol-gel precursor system and polymer spheres as templating agents and present an effective way to deliberately design the final (nano) structure. ^{57}Fe Mossbauer spectroscopy (MBS) has been applied earlier in order to assess the kind and domain structure of the inlets of Multiwalled Carbon Nanotubes. We here present a consequent continuation of the former study: The carbon spheres replace the former MWCNTs and the inner magnetite nanocrystals the former inlets. Since the size of these magnetite domains can be much better controlled than their predecessors over the size of the carbon spheres and better resemble the shape of classical magnetic domains we have received a model kit of a magnetic nano 3D system with many possible applications.

Biography

Werner Lottermoser has completed his thesis work about neutron diffraction and magnetism of special silicates from Francfort University (Germany) and university lecturing qualification on Single Crystal Mossbauer Spectroscopy (SCMBS) in 1996 from Salzburg University (Austria). He is now working on sub-nanometric imaging, nanomaterials, and materials for industrial applications. He has published more than 65 papers in reputed journals and 150 abstracts and has been serving e.g. for one year as a referee board member at the Journal of Physical Chemistry A.

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