

Silver nanoparticles as filler in Polydimethylsiloxane composites

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Silver nanoparticles (AgNPs) have attracted considerable attention due to their catalytic, electronic and optical properties which differ from bulk. The “polyol” synthesis has emerged as a convenient way of preparing AgNPs and tuning their properties such as size and shape. Because of their high polarizability, the dispersion of AgNPs into a polymeric matrix leads to an enhancement in the dielectric constant (ϵ) of the resulting material. This approach is of considerable attraction for preparing dielectric elastomer actuators.

In this work, AgNPs were prepared and their electronic properties used to increase the ϵ of polydimethylsiloxane (PDMS) by blending. Prior to the dispersion into the polymeric matrix, the AgNPs require an initial silica coating via hydrolysis of tetraethoxysilane (TEOS) to prevent possible percolation leading to electric shortcuts. Furthermore, the silica surface has to be subjected to hydrophobic treatment in order to ensure a good dispersion of the AgNPs in PDMS. The surface can be hydrophobized by either grafting an alkyl chain or an initiator which can be used to initiate a surface polymerization such as ATRP. Upon cross-linking of PDMS, it was possible to obtain elastomeric films which can be used for further investigation as prospective flexible electronics components.

Biography

Jose Enrico Q. Quinsaat has completed his MSc in Chemistry from the Swiss Federal Institute of Technology in Zurich, Switzerland in 2011 and in the same year he started his PhD studies in the Department of Material Science and Engineering (EDMX) at the Swiss Federal Institute of Technology in Lausanne, Switzerland. He is currently a member of the Laboratory of Functional Polymers at Empa working on the synthesis of silver nanoparticles and their potential as filler agents in PDMS composites intended to be used for electronic applications.

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