ENHANCING THE DIELECTRIC PROPERTIES OF PDMS BY USING FUNCTIONALIZED SILVER NANOPARTICLES AS HIGH PERMITTIVITY FILLER

QUINSAAT Jose Enrico, ALEXANDRU Mihaela, TESTINO Andrea, HOFMANN Heinrich, NUEESCH Frank, OPRIS Dorina

Empa - Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland

Abstract

The blending of inorganic nanoparticles into polymers allows access to a large variety of materials which show enhanced electrical, thermal, mechanical, magnetical or optical properties. In particular, silver nanoparticles (AgNPs) have gained a lot of attraction for its array of properties that can be tuned through the control of size and morphology offered by the polyol synthesis. The high polarizability of the AgNPs allows to increase the dielectric constant of polymer based nanocomposites such as polydimethylsiloxane (PDMS)/AgNPs. However, the challenge of preparing PDMS/AgNPs starts at the very beginning since large quantities of AgNPs (10-100 g) are required for composite preparation and testing. Despite the numerous reports on the preparation of AgNPs using the polyol synthesis, most of these methods only yield particles in milligram quantities per batch. In this work, AgNPs were prepared in large quantities (gram scale) by preparing them in a continuous fashion by using the segmented flow tubular reactor (SFTR). The AgNPs were then subjected to surface functionalization which consists of coating them with a thin silica shell followed by surface hydrophobization using hexamethyl disilazane (HMDS). The surface-functionalized AgNPs were eventually blended into the polymeric PDMS matrix in order to give metal/polymer nanocomposites with enhanced dielectric properties.

Keywords: silver nanoparticles, polyol synthesis, SFTR, nanocomposites, PDMS, dielectric constant

Author did not supply full text of the paper/poster.