

Supporting Information

***In Situ* Synthesis of Silver-epoxy Nanocomposites by Photoinduced Electron Transfer and Cationic Polymerization Processes**

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EXPERIMENTAL

Materials

Epoxy resin, 3,4-epoxycyclohexylmethyl-3',4'-epoxycyclohexanecarboxylate (EEC, DOW), silver hexafluoroantimonate (AgSbF_6 , Aldrich), and the radical photoinitiator, 2,2-dimethoxy-2-phenyl acetophenone (DMPA, Irgacur 651, Ciba) were used as received.

Sample preparation, UV-curing and characterization

The EEC resin formulations containing AgSbF_6 (1-5 wt%) and DMPA (2 wt%) were coated onto glass substrates using a wire-wound applicator, and then the films were exposed to UV light under nitrogen atmosphere, with radiation intensity on the surface of the sample of 30 mW/cm^2 , obtaining films of about $100 \mu\text{m}$.

The kinetics of the photopolymerization was determined by Real-Time FT-IR spectroscopy, employing a Thermo-Nicolet 5700. The formulations were coated

onto a silicon wafer. The sample was exposed simultaneously to the UV beam, which induces the polymerization, and to the IR beam, which analyze *in situ* the extent of the reaction. Because the IR absorbance is proportional to the monomer concentration, conversion versus irradiation time profiles can be obtained. Epoxy group conversion was followed by monitoring the decrease in the absorbance due to epoxy groups in the region $760\text{-}780\text{ cm}^{-1}$. A medium pressure mercury lamp equipped with an optical guide was used to induce the photopolymerization (light intensity on the surface of the sample of about 30 mW/cm^2). Variation in the experimental conditions (light intensity, humidity, temperature) caused slight differences in the kinetic curves. For these reasons, all measurements were performed at the same day under identical conditions, thus good reproducibility was obtained. All the polymerization reactions were performed at room temperature at constant humidity ($\text{RH} = 25\text{-}30\%$); the samples were stored for at least 24 hours before properties evaluation.

The gel content of the cured films was determined by measuring the weight loss after 24 hours extraction with chloroform at room temperature, according to the standard test method ASTM D2765-84.

For transmission electron microscope (TEM) measurements, samples were prepared by Argon ion polishing system GATAN PIPS, working at 3.5 keV at an angle of 7° . They were examined in a 300 keV TEM Philips CM30. TEM micrographs were processed with a slow scan CCD camera and analyzed with the Digital Micrograph program. The TEM measurements were always

performed using a very low electron flux in order to avoid any structural modification of the sample induced by the electron beam.

Dynamic mechanical thermal analyses (DMTA) were performed with a Rheometric Scientific MKIII (UK) instrument, at a frequency of 1 Hz in the tensile configuration.