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Curing epoxy with polyvinylpyrrolidone (PVP) surface-functionalized NixFe3-xO4 magnetic nanoparticles

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Abstract: Cathodic electrodeposition method was applied in synthesis of three types of superparamagnetic iron oxide nanoparticles (SPIONs): bare SPIONs, polyvinylpyrrolidone (PVP)-coated SPIONs (PVP-SPIONs) and Ni2+-doped PVP-SPIONs (PVP/Ni-SPIONs). The synthesized nanoparticles were well characterized by X-Ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), field-emission scanning electron microscopy (FE-SEM), and vibrating sample magnetometer (VSM). The potential of the modified SPIONs for curing in an epoxy/amine system having very low nanoparticle concentration was investigated in terms of *Cure Index* applying nonisothermal differential scanning calorimetry (DSC) at different heating rates. A shift in cure behavior from *Poor* to *Good* crosslinked epoxy networks by replacing PVP-SPIONs by PVP/Ni-SPIONs in the system was indicative of complementary role of SPIONs doping in Ni, which improved activation of surafce SPIONs towards PVP macromolecule, then thanks to its catalyzing effect enhanced epoxy ring opening due to Ni2+ cations incorporation.