## Abstract

Polyaniline–silver composites combine the electrical properties of metals and the material properties of polymers. Polyaniline is one of the most studied conducting polymers on account of high electrical conductivity (units S $cm^{-1}$), environmental stability, ease of preparation from common chemicals, good processibility and low cost. Silver is well known because of its highest conductivity among metals (500 000 S $cm^{-1}$), antibacterial properties, and low price compared to other noble metals. Aniline was oxidized with silver nitrate in acidic aqueous medium to polyaniline–silver composite. The presence of different organic acids was studied. The most promising became methanesulfonic acid solution, in which most problems (such as inhomogeneity of samples and limited solubility of silver salts) got solved. The oxidation of aniline with silver nitrate is slow and takes over several months to get a reasonable yield. An addition of a small amount of *p*-phenylenediamine, even 1 mol. % relative to aniline, shortens the reaction time to several hours or even to tens of minutes. Small amounts of ammonium peroxydisulfate had similar effect. The content of silver in composites is fixed by the stoichiometry of reaction, and composites always contain ≈70 wt.% of silver. By using mixed oxidants, silver nitrate and ammonium peroxydisulfate, silver content can be controlled. The molecular structure of composites was characterized by Fourier-transform infrared, Raman and UV–visible spectroscopies. Morphology of the sample was investigated by optical and transmission electron microscopies. Molecular weight was estimated by gel permeation chromatography operating with *N*-methylpyrrolidone and calibrated with polystyrene standards. For measurement of conductivity, four-point van der Pauw method was used. The content of silver was determined by thermogravimetric analysis or by ash. The highest conductivities of composites were of the order of 1 000 S $cm^{-1}$.