

Environmentally friendly ZnO/Castor oil polyurethane composites for the adsorption of acid VOCs

A green and scalable up procedure for the synthesis of ZnO-castor oil polyurethane (COP) composites for the adsorption of acetic acid (AA) was successfully achieved. The adsorption capacities of AA of the novel materials were studied in function of different synthetic parameters including reaction temperature and time, reactants ratios and ZnO particles dimensions. AA is a common pollutant, present in museums and art galleries, which could irreversibly damage cultural heritage. The performances of the materials were evaluated operating at two different AA concentrations, including saturated atmosphere and low ppmv concentration. The tests in saturated atmosphere of AA were followed by desorption under vacuum, and adsorption capacities were calculated consequently. The materials were fully characterized prior and after adsorption tests through scanning electron microscopy (SEM), thermogravimetric analysis (TGA) and attenuated total reflection infrared spectroscopy (ATR-FTIR). The adsorption capacities obtained in the test in saturated atmosphere of AA demonstrated that ZnO/COPs is significantly higher than the commonly employed activated charcoal. Experiments also demonstrated a synergetic effect between the polyurethane structure and ZnO for the adsorption of AA.