Crystallizing Vanadium Pentoxide Nanostructures in the Solid-State Using Modified Block Copolymer and Chitosan Complexes

Diaz C.

Barrera G.

Segovia M.

Valenzuela M.L.

Osiak M.

O'Dwyer C.

A systematic study of the synthesis of V<inf>2</inf>O<inf>5</inf> nanostructured materials using macromolecular PS-co-4-PVP·(VCl<inf>3</inf>)<inf>y</inf> and chitosan·(VCl<inf>3</inf>)<inf>y</inf> complexes is presented. It is demonstrated that various coordination degrees of the metal into the polymeric chain specifically influence the product formation after pyrolysis. PS-co-4-PVP·(VCl<inf>3</inf>)<inf>y</inf> and chitosan·(VCl<inf>3</inf>)<inf>y</inf> complexes were prepared by simple coordination reaction of VCl<inf>3</inf> with the respective polymer in molar ratios 1: 1, 1: 5, and 1: 10 metal/polymer and characterized by elemental analysis, IR spectroscopy, and TGA/DSC analysis. Solid-state thermolysis of these precursors at several temperatures under air results in nanostructured V<inf>2</inf>O<inf>5</inf> using all precursors. The size and shape of the nanostructured V<inf>2</inf>O<inf>5</inf> depend on the nature of the polymer. For the chitosan·(VCl<inf>3</inf>)<inf>y</inf> precursors sub-10 nm nanocrystals are formed. The calcination process, involved in the preparation method, produces V<inf>2</inf>O<inf>5</inf> with photoluminescence in the visible light region, suggesting the possible application in oxygen sensing devices.