SOL-GEL DERIVED POLYVINYL ALCOHOL/SILICA HYBRID FILMS

№ [7813]

A.A. Boiko[1], E.N. Poddenezhny[1], N.E. Drobyshevskaya[1], N.V. Borysenko[2], Niyazi A.S. Al-Areqi[3], and Marwan F.S.H. AL-Kamali[1]

[1]Sukhoi Gomel State Technical University, 48 Oktiabria Av.,Gomel 246746, Belarus.
[2]Chuiko Institute of Surface Chemistry, NAS of Ukraine, 17 General Naumov Str., Kyiv 03680, Ukraine.
[3]Department of Chemistry, Faculty of Applied Sciences, Taiz University, Taiz, Yemen.

Abstract

Polymer-inorganic nanocomposite materials, in which polymers serve as hosts for inorganic nanoparticles, are promising materials for many applications due to their extraordinary properties. The combination of these two different building blocks at a molecular level could provide novel properties that are not obtained from conventional organic or inorganic materials. The sol-gel method is a common process to synthesize polymer-inorganic nanocomposites. It consists of an initial hydrolysis reaction, a subsequent condensation reaction followed by removal of the solvents, resulting in formation of metal oxides. Poly(vinyl alcohol) (PVA), a water soluble hydrophilic polymer, has been studied intensively for membrane applications because of its good chemical stability, film-forming ability and high hydrophilicity. However, PVA has poor stability in water. Among various insolubilisation techniques, hybridization between PVA and inorganic particles has received significant interest as it not only restricts the swelling of PVA but also provides the inherent advantages of the organic and inorganic compounds.

The hybrid films were prepared via a sol-gel route by using tetraethoxysilane (TEOS) as the silica precursor with HCl acid as an hydrolyzed agent. The resulting hybrid films with varying silica contents were characterized with SEM and XRD techniques. Ours studies have shown that introducing an inorganic component derived from Si-containing precursors (TEOS) into PVA can form homogeneous composite films with enhanced physicochemical stability.

Keywords: polyvinyl alcohol/silica, Sol-gel, SEM, XRD.