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Fabrication of Silver Nanoparticles Embedded Polymer Nanofibers as an Antimicrobial Agent

Silver nanoparticle embedded poly(vinyl alcohol) (PVA) nanofibers were fabricated by high-temperature melt-spinning using 2,2'-azobis(isobutyronitrile) as a reducing agent and initiator. In this methodology, PVA acted both as a gelator to form the nanofibers and as a stabilizer to protect the silver clusters from sintering. UV-vis spectroscopic analysis indicated that the silver nanoparticles were continuously released from the polymer nanofiber in aqueous solution. The antimicrobial properties of silver/PVA nanofiber against both Gram-negative (Escherichia coli) and Gram-positive (Staphylococcus aureus) bacteria were evaluated using minimum inhibitory concentration (MIC) and modified Kirby-Bauer methods, and kinetic tests. The MIC test demonstrated that the silver/PVA nanofiber had the enhanced antimicrobial efficacy than silver sulfadiazine and silver nitrate at the same silver concentration.

Sol-gel polycondensation modeling: Molecular dynamics simulation approach

Sol-gel processing of alkoxysilanes and organoalkoxysilanes is a promising technique to produce inorganic polymers, silicon oxides and other low-k materials. Because the properties of these materials depend critically on how the components are combined, we follow the dynamic evolution of the silica structures using alkoxysilane building blocks. To this end, molecular dynamics simulation that accounts for polycondensation of alkoxysilanes is developed to construct an amorphous silica network. Bulk density, porosity and elastic modulus are determined as a function of degree of condensation.

Optoelectrical characteristics of hybrid nanowire of poly (3-methylthiophene) with 2 PI-

PPV synthesized by sol-gel reaction of organically modified silanes. Patternability and strong variation of reaction conditions and e-beam crosslinkable organic functional groups directly e-beam crosslinking of functionalized organic groups of resulting organosilicate polymers. As a result, silver nanoparticles embedded in the nanowires were soluble in common organic solvents and can be spin-coated on ITO or quartz plates. Homogeneous films were formed. The results showed that the nanosized silver nanoparticles embedded polymer nanofibers as an electron-emitting layer could be used for light-emitting diodes. The nanosized red light-emitting materials in which fluorene, thiophene and benzothiadiazole moieties are introduced into nanosized cores - polymeric oligomeric silsesquioxanes (POSS) - were synthesized by Suzuki coupling and hydrolysis reaction. The molecular structures of the nanosized materials were confirmed by H-NMR and MALDI-TOF. Thermal properties were characterized by DSC and TGA. Optical properties were investigated by UV-vis and PL and the PL spectra showed red region emissions. The materials are soluble in common organic solvents and can be spin-coated on ITO or quartz plates. Homogeneous films were formed. The results showed that the nanosized materials are promising red light-emitting materials for solution processing technique.