186.

INORGANIC-ORGANIC HYBRID COATINGS FOR METAL AND GLASS SURFACES

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Inorganic composite materials have been tailored by sol-gel synthesis for two different applications. In the first case, a composite from SiO_2, diphenyl silanes and methylvinyl silanes was modified by an amino silane and crosslinked by dioles, leading to a sealing strength of more than 10 N/cm when used as a hot melt for sealing copper to polyimine. In the other case, an ormocer type of coating was modified by nanoscaled γ-Al_2O_3 and a low-curing transparent coating material with very high scratch resistances was obtained.

187. NOVEL ORGANIC:INORGANIC COMPOSITE MATERIALS FOR PHOTONICS. Paras N. Prasad, Frank V. Bright, Upvan Narang, Run Wang and Richard A. Dunbar, Photonics Research Laboratory and Department of Chemistry, State University of New York at Buffalo, Buffalo, NY 14214

A polymeric composite structure offers the opportunity to optimize each necessary property independently to produce useful materials for photonics. This paper presents investigation of two types of photonic properties in a new class of inorganic oxide glass:organic composites prepared by sol-gel processing. They are nonlinear optical functions and photonics sensors. Stable electric field induced alignment has been achieved for second-order nonlinear optical effects such as second harmonic generation and electro-optic modulation. Supercritical drying has been used for obtaining low loss optical wave guides. In the inorganic glass:polymer composites, prepared for third-order nonlinear optical effects, the nonlinear optical response has been investigated using femtosecond degenerate four-wave mixing, Kerr gate and transient absorption. The ability to form these sol-gel processed hybrid materials into films, monoliths and fibers, and to control the microstructure for producing optically transparent bulk with desired porosity make them very suitable for development of chemical and biosensors. We have successfully encapsulated fluorescent probes and intact antibodies and demonstrated sensor functions.

188. HYBRID ORGANIC-INORGANIC SILICA MATERIALS: A CHEMICAL EVIDENCE FOR ORGANIZATION OF THE SOLID.

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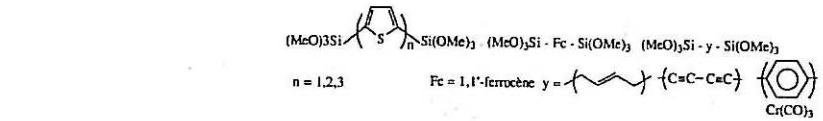
The preparation of solids by the sol-gel process is a very fast and general way to obtain organic-inorganic hybrid solids. This paper describes the preparation of hybrids obtained from the following precursors.



The organic units are included inside of the silica network. At the opposite the corresponding monosilylated units are located at the surface of the solid.

The chemical and electrochemical behavior of these hybrids permit to conclude to a possible degree of organisation of the organic units inside of the amorphous silica network.

189. INORGANIC/ORGANIC HYBRID MATERIALS: CONDUCTING POLYMER-SILICA COLLOIDAL COMPOSITE PARTICLES S.P. Armes, M. Gill and S. Maeda, School of Chemistry and Molecular Sciences, University of Sussex, Falmer, Brighton, BN1 9QJ, U.K.

Recently we have described the preparation and characterisation of inorganic/organic hybrids of small silica particles with conducting polymers such as polyaniline and polypyrrole. These nanocomposites can be easily prepared as stable colloidal dispersions of sub-micron dimensions and the silica content can be varied over the range 30-70 wt.%. We have characterised these colloids in terms of their particle morphology and chemical composition by a wide range of techniques, including transmission electron microscopy, elemental microanalyses, thermogravimetry, d.c. conductivity measurements, disc centrifuge photosedimentometry and dynamic light scattering. The nanomophology and surface composition of these composite particles has been examined by SAXS and XPS respectively. We are currently evaluating these hybrid composites for use as surface-functionalised pigment particles in immunodiagnostics assays and also in military camouflage applications.

190. FABRICATION AND STUDY OF HYBRID MOLECULE/SUPERCONDUCTOR ASSEMBLIES, John T. McDevitt, Steven G. Haupt, David Jurbergs, David R. Riley, Jianai Zhao, Ji-Ping Zhou, Kate Lo, James Grassi and Christopher Jones, Department of Chemistry and Biochemistry, The University of Texas at Austin, Austin, TX 78712.

The fabrication of electronic devices from molecular materials has attracted much attention recently. Schottky diodes, molecular transistors, metal-insulator-semiconductor diodes, MIS field effect transistors and light emitting diodes have all been prepared utilizing such substances. The active elements in these devices have been constructed by depositing the molecular phase onto the surface of a metal, semiconductor or insulating substrate. With the recent discovery of high temperature superconductivity, new opportunities now exist for the study of molecule/superconductor interactions as well as for the construction of novel hybrid molecule/superconductor devices. In this paper, methods for preparing the first two classes of composite molecule/superconductor devices will be reported. Consequently, light sensors based on organic dye-coated superconductor junctions as well as molecular switches fashioned from organic conductive polymer coated superconductor microbridges will be discussed. Moreover, the initial results related to the study of molecule/superconductor energy and electron transfer phenomena will be reported.

191. REINFORCEMENT OF POLYURETHANE BY IN-SITU PARTICLE PRECIPITATION.

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Mechanical properties of polymers can be significantly improved with the incorporation of inorganic particulate fillers. In this work, polyurethane has been synthesized with a trimethoxysilane group pendant to the backbone chain. The functional group is chemically similar to tetraethoxysilane (TEOS) and allows the polyurethane to enter into a hydrolysis and condensation reaction with TEOS. After TEOS exposure, spherical particles are formed that are approximately 0.1 to 0.25 microns in diameter as measured by electron microscopy. They are evenly dispersed in the polyurethane matrix. The presence of the particles increases Tg by approximately 30°C in comparison to the unfilled polyurethane. The plateau modulus is increased an order of magnitude and extends to temperatures approximately 70°C higher than the polyurethane matrix without particles.

192. TEMPERATURE DEPENDENCE OF THE LENGTH SCALE OF LOCAL SEGMENTAL MOTION IN PVC FROM DIELECTRIC MEASUREMENTS. K.L. Ngai*, J. Colmenero**, A. Arbe**, *Naval Research Laboratory, Washington, D.C.20375-5320, **Departamento de Fisica de Materiales, Universidad del Pais Vasco, 20080 San Sebastian, Spain.

The coupling model has been found repeatedly to offer faithful description of cooperative relaxation processes in dense packed correlated systems such as amorphous polymers. It proposes the existence of a temperature insensitive crossover time, t_c, separating two time regimes in which the dynamics of relaxation cross over from $\exp-t/\tau_o$ to $\exp-(t/\tau^*)^{1-n}$ where the two relaxation times are related by the relation $\tau^*=[t_c^{-n}\tau_o]^{1/(1-n)}$. Direct experimental test of the coupling model can be performed by using time-of-flight (TOF) neutron scattering which monitors the local segmental dynamics in the time window of $10^{-13}<t<10^{-11}$ and the expected crossover at t_c. Recent neutron scattering measurements performed on a very 'fragile' polymer PVC [1] has