using tetraalkoxysilanes possessing polymerizable alkoxides. Through the simultaneous hydrolysis-condensation and free radical polymerization of these precursors, non-shrinking sol-gel composites are produced consisting of mutually interpenetrating networks of the inorganic and organic phases. The properties of these resulting composites can range from a transparent flexible material to a transparent hard material simply by changing the organic polymer in the composite. In these existing systems, the organic polymers exist as random coils. Recently, we have been interested in forming composites possessing structurally well-defined organic polymers. To this end, we have been interested in homogeneously impregnating inorganic networks with liquid crystalline polyisocyanates which are known to adopt regular helical structures. Further work involves synthesizing copolymers possessing regularly spaced $-Si(OR)_3$ groups to act as spatial modulators during the growth of the inorganic phases.

209. SOL-GEL-BASED INORGANIC-ORGANIC COMPOSITE MATERIALS. H. K. Schmidt, Institut für Neue Materialien, 6600 Saarbrücken, Fed. Rep. of Germany.

The sol-gel process as a soft-chemistry route for glass and ceramics can be modified by incorporating organics and be used to fabricate inorganic-organic composite materials. One of the major problems related to this type of processing is the control of phase size of the inorganic and the organic part. Therefore, it is necessary to provide links between inorganic and organic units. Phase size of the inorganic components can be controlled by growth controlling additives (GCA) which can be used to stabilize inorganic particles in the nano range. If these additives are bifunctional, for example, carrying hydrolyzable silanes or polymerizable groups, the modified particles can be used as precursors for further processing like sol-gel precursors or organic monomers. Using these conceptions, it is possible to process ceramic polymer, semiconductor polymer or even metal polymer composites with phase dimensions in the lower nano range to be used for optical purposes. In the paper, the basic conception, synthesis chemistry and examples for application will be given.

210. PHOTOINITIATED POLYMERIZATION OF NOVEL FLUOROALKYL ETHER DERIVATIVES OF ETHYL α-(HYDROXYMETHYL)ACRYLATE.
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Four monomers were obtained from ethyl α-(chloromethyl)acrylate by substituting with alcohols containing one (F_1), three (F_3), seven (F_7), and ten $-CF_2$ (F_{10}) groups. The lower three homologs were isotropic liquids while the F_{10} monomer was liquid crystalline having a smectic B-like phase. UV photopolymerization of these monomers in the isotropic phase using 1 wt-% 2,2-dimethoxy-2-phenyl acetophenone as photoinitiator showed an increase in the polymerization rate and conversion in the order $F_1<F_3<F_7<F_{10}$. The polymerization rate is higher in the isotropic phase than in the mesophase for the F_{10} monomer due to a large decrease in the propogation rate constant in this highly ordered smectic phase. Interestingly, polymerization of F_{10} in the mesophase continued even after the initiating light source was turned off. Long radical lifetimes in the mesophase were confirmed by electron spin spectroscopy of various polymerizing samples which showed high radical concentrations for long times after removing the initiating source.

211. PROCESSABLE FLUOROPOLYMERS WITH LOW DIELECTRIC CONSTANTS: PREPARATION AND STRUCTURE-PROPERTY RELATIONSHIPS OF POLYACRYLATES AND POLYMETHACRYLATES
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The preparation of a series of processable heavily fluorinated acrylic and methacrylic homo- and co-polymers with low dielectric constants is carried out to elucidate the structure-property relationships. The monomers were prepared through the condensation of the respective alcohols with acryloyl and methacryloyl chloride. Unlike