Photopolymerizations Center (PC)

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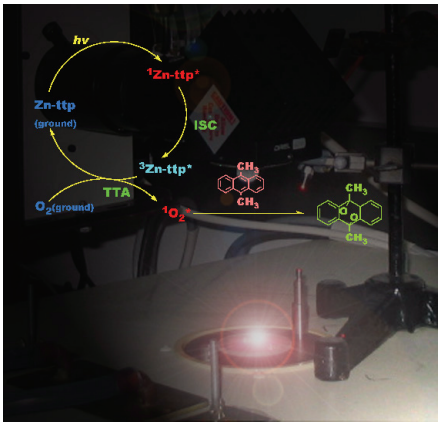
Improved UV Curable Systems

Progress on Thiol-ene-acrylate UV Curable Systems has been made via fundamental research conducted at the Photopolymerizations Center on the kinetics and relative polymerization ratios of the three chemical components in thiol-ene-acrylate UV curable systems. The work has led to a greater understanding of competing reactions. Kinetics studies conducted at the center using model systems have been relevant to proprietary technology under development in the R&D facility of National Starch and Chemical Company. These insights have enabled the company to enhance the performance of their opto-electronic adhesive products.
For more information, contact Dr. Christopher Bowman at the University of Colorado, 303.492.3247, Christopher.Bowman@colorado.edu.

Improvement in Photo-Cured Acrylate Coatings



At the University of Iowa's Photopolymerizations Center, a photochemical method to eliminate oxygen inhibition in free-radical photopolymerizations has been developed. This work provides a unique and practical solution to a major problem in photo-cured acrylate coatings: that curing is inhibited by air at the coating surface; the Henkel Corporation expects this technology to be of significant commercial value. The company attributes commercial successes to research at this center. For more information, contact Alec Scranton, 319.335.1414, alec-scranton@uiowa.edu.

Ultra-Rapid Photopolymerization Method

Novel (meth)acrylate monomers for ultra-rapid photopolymerization have been developed by researchers at the Photopolymerizations Center (PC). This program has identified and characterized several new monomers that provide highly photosensitive acrylate compositions with excellent physical and mechanical properties. These materials have potential for the design of improved structural adhesives in engineering applications. One application noted by UCB Chemicals is that of inks used in printing on food packages. Fast-reacting monomers can reduce both cost and food contamination. The fast-reacting monomers result in inks that dry faster and in packaging that is not as slippery, thereby improving the ability to stack packages. These two effects help reduce packaging costs.

An added benefit to the fast-drying ink is that it does not seep through the packaging, and therefore does not contaminate food contained in the package with chemicals. For more information, contact Christopher Bowman, 303.492.3247, christopher.bowman@colorado.edu.

Dental Restorative Materials

Research at the Photopolymerizations Center (PC) in the field of dental restorative materials has recently received a great deal of attention and numerous accolades. The research group has applied their expertise to address the ongoing issues associated with the high degree of polymerization shrinkage with highly cross-linked dental composites. The substantial shrinkage of these materials generates interfacial stresses between the restorative and the tooth structure. These stresses may lead to micro cracking of the restorative and tooth structure, microleakage at the tooth/restorative interface, and occasionally catastrophic failure of the restorative. Seminal efforts from the group using a unique photoiniferter technique has shown that there is a direct correlation between the physical properties of the "cured" restorative and the degree of methacrylate conversion of the restorative--independent of the methodology used to achieve a given degree of conversion. Development of an instrument to simultaneously measure degree of conversion and polymerization shrinkage stresses of polymerizable materials is underway. This key effort will likely direct future shrinkage reduction efforts away from light exposure protocols and towards new chemical strategies. For more information, contact Christopher Bowman, 303.492.3247, christopher.bowman@colorado.edu

Moisture Effects on Cationic Cure of Adhesives

The chemistry of cationic cure is critically important for pressure sensitive and laminating adhesives and also in some UV curable systems. Research at the Photopolymerizations Center has established that the mechanical and physical properties of the cured materials are even more directly related to moisture content during cure than was heretofore thought to be the case. Microscopy work on this project has helped the National Starch and Chemical Company to better understand the chemical effects of moisture and to determine steps necessary for enhancement of the performance of pressure sensitive laminating and opto-electronic adhesives. For more information, contact Julie Jessop, University of Iowa, 319.335.0618, Julie-Jessop@uiowa.edu, Jeffrey Stansbury, the University of Colorado Health Sciences Center, 303.724.1044, Jeffry.Stansbury@uchsc.edu, or Alec Scranton, the University of Iowa, 319.335.1414, Alec-Scranton@uiowa.edu.