**283d In-Situ Monitoring of Photopolymerization Using Microrheology**

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Photopolymerization is the basis of several multi-million dollar industries including films and coating, inks, adhesives, fiber optics, and biomaterials. The fundamentals of the photopolymerization process, however, are not well understood. As a result, spatial variations of photopolymerization impose significant limitations on applications in which a high spatial resolution is required.

In this work a photosensitive resin is exposed to ultraviolet light, while the Brownian motion of micron sized, inert fluorescent tracer particles is tracked using optical videomicroscopy. Statistical analysis of particle motion yields data that can be used to extract rheological information about the embedding medium as a function of time and space, thereby relating UV exposure to the polymerization and gelation of monomeric resins.

The effects of varying depth, initiator concentration, inhibitor concentration, composition of the monomer, and light intensity on the gelation process were studied. The most striking result is the measured difference in gelation time observed as a function of UV penetration depth. A consistent trend was observed when varying light intensity and monomer composition. The results affirm the ability of microrheology to provide the high spatial and temporal resolution necessary to accurately monitor the photopolymerization process.

The experimental data provide a better understanding of the photopolymerization process, which could lead to improved industrial process optimization. The use of microrheology to monitor photopolymerization can also lead to the development of more accurate process models and offer the ability to do in-situ quality control of the process.