

RELATION BETWEEN STRUCTURAL PATTREN OF CYANINES AND THEIR EFFICIENCY TO INITIATE FREE RADICAL AND CATIONIC PHOTOPOLYMERIZATION

Qunying Wang, Bernd Strehmel

Department of Chemistry, Institute for Coatings and Surface Chemistry, Niederrhein University of Applied Sciences, Adlerstr. 1, D-47798 Krefeld, Germany

New high-intensity NIR-LEDs emitting either at 860/870 nm or 940 nm have attracted increasing interests among researches in photopolymerization particularly with the focus to develop novel initiating systems. This possesses some benefits compared to UV initiated polymerization; that is deeper penetration of excitation light and the fact that these systems work according to a dual mechanism based on the consumption of photons and the release of heat. Consequently, the longer wavelength facilitates deeper penetration of excitation light into the sample and offers therefore more possibilities for photocuring in systems comprising components absorbing in the UV and visible range. The development of these new devices has brought new impetus in this field since their strong radiation field facilitates to overcome internal activation barriers. In this pioneering work, different cyanines derived from tri-, penta-, hepta-, and nona-methines carrying a special conjugated pattern facilitate generation of heat and some can initiate both free radical and cationic photopolymerization as combined with new NIR-LED systems. This was followed by real-time FTIR spectroscopy in which an iodonium salt was introduced carrying modern anions showing no issue to release HF under certain conditions. Here, we report the curing of epoxides, vinyl ethers and oxetanes for cationic photopolymerization followed the kinetics by methods *vide supra* and copolymerization for the preparation of interpenetrating networks applying multi-functional acrylic esters for radical polymerization. In this system, the heat generated by the NIR-sensitizer uptakes a special function which facilitates generation of initiating species such as radicals and conjugate acid for radical and cationic polymerization, respectively, based on a photonic process. This was concluded by DMA measurements while time-resolved fluorescence enabled a deeper understanding of occurring photochemical pathways.

