

Functional ZnO nanoparticles as photo-initiators

Michael Schmitt^{1*}

¹Physical Chemistry, Saarland University, Saarbrücken, Germany

*mic.schmitt@email.de

Semiconductors like ZnO are well-known for their charge transfer potential and their photo-catalytic properties. Recently we have proven that modified nanoscaled ZnO have the potential to be useful as photo-initiator for radical polymerisation of bulk materials[1][2]. NanoPI can be migration-less/free, “harmless” photo-initiators with tuneable, selective absorbance. Such initiators are of dire need for applications resulting to products like food packages. In addition to the demonstration of a possible non-fragmenting system this contribution deals with the effect of modifier content (e.g. levulinic acid) during the synthesis. Levulinic acid is a small molecule which to not contain reactive or aromatic/ chromophore functionalities. The synthesis is maximal a two-step procedure whereby the injection procedure leads to non-surface modified (eventually doped) bare, well-defined nanoparticles (spherical, smaller than 10 nm). A non-doped batch was used for different modifications so that the effect of the modifier can be analysed independent from the influence of the precipitation. Monitoring of the polymerisation of a multifunctional acrylic ester resin took place by using novel transition UV-curing equipment[3], compare to Figure. Thereby an absolute and spectral calibrated xenon flash light illuminates the sample and a diode array detector measures the reaction progress down to the time range of the flash distance (down to 30 ms).

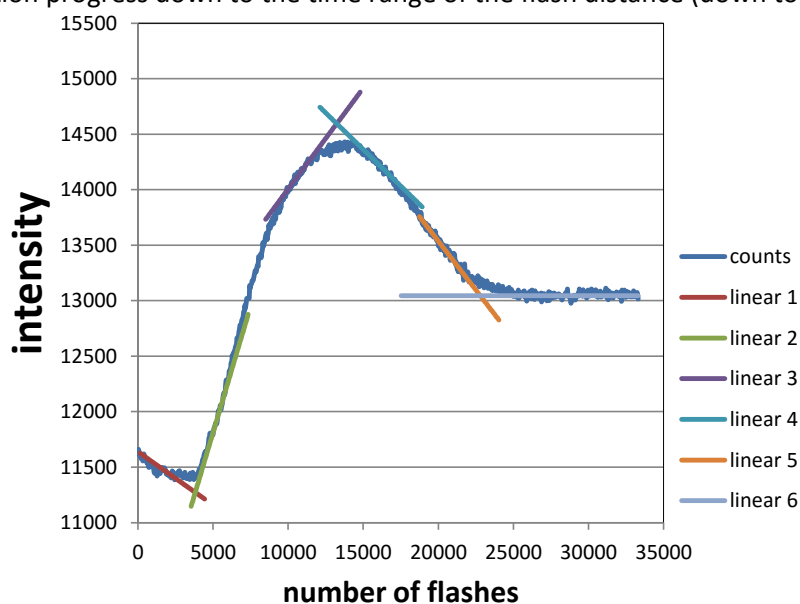


Figure 1 Example analysis for one wavelength point of the UV-curing experiment. The transmitted intensity results in a reaction dependent slope.

- [1] M. Schmitt; *Macromol. Chem. Phys.* ZnO nanoparticles induced Photo-Kolbe-reaction, fragment stabilization and effect on photo polymerization monitored by Raman-UV-Vis-measurements, 2012, **213**, 1953.
- [2] M. Schmitt, *Nanoscale Synthesis and testing of ZnO nanoparticles for photo-initiation: Experimental observation of two different non-migration initiators for bulk polymerization*, 2015, **7**, 9532.
- [3] M. Schmitt; *Macromol. Chem. Phys.* New method for real-time monitoring of photo-polymerization by UV-Vis-spectroscopy, 2011, **212**, 1276.