

Section 2

Executive Summary of the Project:

An aqueous polyurethane system was developed and it has been end-capped with ene groups to facilitate UV curing. Stability of the Polyurethane Dispersion (PUD) produced was studied in detail. In addition, the effect of factors such as molar mass of the pre-polymer, PTHF/DMPA ratio etc. on the stability and particle size distribution were studied. It was found that controlling above parameters dispersions with required stability and particle size distributions can be produced. Further, polyurethane films containing iron nano particles were produced. Properties of these composites were studied, too.

During the study it was found that the polyurethanes produced has fluorescent properties that can be used as a special property. A method was developed to make the fluorescent property reversible opening a new avenue to use it as a chemical sensor.

XRD, FTIR, DSC, UV-Vis and fluorescent spectroscopy was used to characterize films prepared. Factors such as crystallinity, H-bonding, thermal properties and optical behavior of films with different morphologies were investigated. A mechanism to explain the behavior of the film under UV irradiation was developed.

It was found that isolated hard-segments emit a fluorescence peak around 356 nm when excited with 293 nm UV radiation. However, continues exposure reduces the emission peak at 356 nm while producing a new emission peak around 423 nm. It was found that the second peak is due to crystalline hard-segments. In addition, it was found that the solvent used in the film preparation affect the reversibility of the fluorescent behavior. Depending on the procedure used to prepare nano-composites fluorescent properties change significantly.