

## Synthesis of UV curable polyurethane acrylate and their phase separation behaviors

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To investigate the microphase separation behaviors in polyurethane acrylates, one of the critical factors for polymer dispersed liquid crystal (PDLC), ultra-violet (UV) curable polyurethane acrylates were prepared. Twelve different polyurethane acrylates were prepared with varying soft-segment molecular weight, types of reactive diluent, and amount of reactive diluent. Polyurethane acrylates films were characterized by FT-IR, DSC, and XRD. Swelling test was also performed.

The microphase separation of the urethane segments, which is mainly governed by the soft-segment length and compatibility of hard-segments and acrylates due to their similar polarity and hydrogen bonding, is a key parameter to control the ultimate properties of the UV curable polyurethane acrylates. With increasing soft-segment molecular weight, the polyol glass transition shifts to lower temperatures. The microphase separation behaviors increased with increasing cohesive force between hard-segments. Specially, aromatic diisocyanate TDI with relatively high cohesive force showed higher microphase separation than aliphatic component IPDI. The reactive diluent phase is more compatible with the hard-segments of polyurethane, rather than the soft-segments.