Optimization of process conditions for UV-thermal dual curable clearcoats using rotational rheometry and FT-IR

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Incorporating UV-thermal dual curable polymers containing hydroxyl group and C=C bonds for the enhancement of crosslinking network in paints, curing characteristics and rheological properties of automotive clearcoats were systematically investigated by changing process conditions such as curing sequence. The storage modulus (G') and loss modulus (G") were obtained from the frequency sweep test by UV module-implemented rotational rheometer. It is found that the UV-thermal curing process induced a remarkable degree of crosslinking for the cured clearcoats and also the UV-thermal sequence and the contents of thermal radical initiator (TRI) and photo initiator (PI) affected the curing behavior of dual curable clearcoats. It was confirmed from FT-IR results that the conversion of reactive sites was well matched with the rheological properties. From these results, the optimal process of curing systems was elucidated.