Influence of Material Properties on Scratch-Healing Performance of Polyacrylate-graft-Polyurethane Network that Undergo Thermally Reversible Crosslinking

김진철†, 김소영, 이태희, 박영일, 이상호, 노승만
한국화학연구원 그린정밀화학연구센터
(jckim81@krict.re.kr†)

Scratch-healing poly(methyl methacrylate)-co-[poly(methyl metharyleate)-graft-(oligo-caprolactone)] urethane networks containing a DA adduct unit (GCPNp-DAs) were successfully synthesized and shown to be capable of undergoing thermally reversible crosslinking. The synthesized polymers were coated on steel substrates to investigate the influence of their material properties on their scratch-healing performance. The reversible formation of crosslinked and de-crosslinked structures of the GCPNp-DA coatings at Diels Alder (DA) and retro-Diels Alder (rDA) reaction temperatures was demonstrated using FT-IR spectroscopy, differential scanning calorimetry (DSC), oscillatory rheology, and nanoindentation (NI). The scratch-resistance and healing performances of the GCPNp-DA coatings were evaluated quantitatively using a scratch test machine equipped with an optical microscope (OM) and an atomic force microscope (AFM).