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Photo-detachable adhesives composed of photo-depolymerizable poly(olefin sulfone)s

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A novel photo detachable adhesive was prepared using a photo-depolymerizable cross-linked poly(olefin sulfone). Poly(olefin sulfone)s containing photobase generators (PBG) are known to exhibit photoinduced depolymerization. A poly(olefin sulfone) is a 1:1 alternating copolymer of an olefin monomer and sulfur dioxide and the protons on the carbons adjacent to the sulfonyl groups in these polymers are readily abstracted by bases. This abstraction results in a depolymerization chain reaction, and so poly(olefin sulfone)s incorporating a photobase-generating chromophore will undergo a photoinduced unzipping reaction. In this reaction, the primary chain of the poly(olefin sulfone) is depolymerized to regenerate the original olefin monomer together with sulfur dioxide. In the present study, a poly(olefin sulfone) composed of a volatile olefin monomer and a second olefin monomer possessing a cross linkable moiety was synthesized. If a mixture of this poly(olefin sulfone) and a crosslinking reagent is sandwiched between glass plates and cured, the plates will be glued together. Subsequently, irradiating the glued plates with UV light in conjunction with heating will separate the plates. In the present study, a poly(olefin sulfone) incorporating carboxylic acid moieties was synthesized and mixed with a polycarbodiimide crosslinker and a photobase generator. The mixture worked as a thermosetting adhesive and exhibited high adhesive strength on quartz plates, comparable to the bond strengths obtained with commercially-available epoxy adhesives. When the bonded quartz plates were exposed to UV light and subsequently heated to 100°C, the poly(olefin sulfone) depolymerized and the plates could be detached.

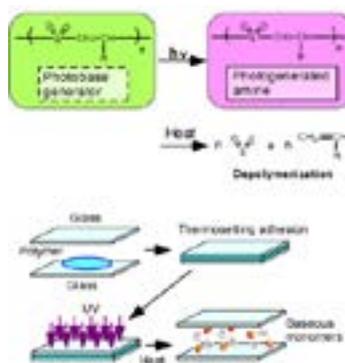


Figure 1: Photoinduced depolymerization of poly(olefin sulfone)s containing photobase generators and a sequence showing a photodetachable thermosetting adhesive.

Biography

Takeo Sasaki is a Professor at the Department of Chemistry, Tokyo University of Science since 2000. He received his Doctorate from the Tokyo Institute of Technology in 1994. He conducts research on Photorefractive Liquid Crystals and Photopolymers. He received the SPSJ Wiley Award (2004) from the Society of Polymer Science, Japan and Senior Membership of SPIE (2016). He is currently a Director of the Japan Liquid Crystal Society and also the Director of the Research Committee on Organic Materials for Information Technology of the Japan Society for Promotion of Science (JSPS).

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