A SELF-HEALING, REPROCESSING AND TRANSPARENT PHOTO-CROSSLINKING PDMS ELASTOMER

Zhu Liua,b, Qinghong Looa, Hongping Xianga, Peng Honga,c, Guocong Liub, Dingshu Xiaob, Zhiquan Lia, and Xiaoxuan Liu*a

a Guangdong Provincial Key Laboratory of Functional Soft Condensed Matter, School of Materials and Energy, Guangdong University of Technology, Guangzhou 510006, Guangdong, China
b Dayawan Chemical Engineering Research Institute of Huizhou University, School of Chemistry and Materials Engineering, Huizhou University, Huizhou, Guangdong, 516007, China
c Zhongshan Forensic Science Institute, Zhongshan, Guangdong, 528400, China

Designing self-healing and reprocessing photo-crosslinking PDMS elastomer with good mechanical strength and transparency remains a challenge. In this work, a self-healing and reprocessing dual cross-linking PDMS elastomer was facilely fabricated by successively UV-induced radical photopolymerization between acrylate-functionalized silicone oil (PDMS-AE) and silicone resin (MDT-AE), and thermo-curing between carboxyl- and amido-functionalized silicone oil. The PDMS elastomer showed fleetly photopolymerization rate and conversion, excellent healing efficiency of nearly 100% and recovery efficiency over 90%. Moreover, the elastomer can be repeatedly repaired multiple times with efficiency over 92% and the reprocessing elastomer can also still repair damage with efficiency over 90%. This is all due to the rearrangement of crosslinked networks via reversible breakage and reformation of ionic bonds. Besides, transparence and yellowing-resistance of the PDMS elastomer can well endure after multiple thermal-induced repairing and reprocessing process. Consequently, a new inspiration is provided to construct transparent and yellowing-resistant PDMS elastomer with excellent self-healing and reprocessing properties.