A Facile Approach to UV/Heat Dual-Responsive Triple Shape Memory Polymer

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Materials: The epoxy precursors, including diglycidyl ether of bisphenol A (E51), Neopentyl glycol diglycidyl ether (NGDE), and the curing agent (Jeffamine D-230) were obtained from commercial sources. Poly(phosphoric acid) was purchased from Aladdin Reagents Co., LTD. Methanol (HPLC degree), dichloromethane (HPLC degree), chloroform (HPLC degree), sodium carbonate, DMF (HPLC degree), acetonitrile (HPLC degree) pyridine-2,6-dicarboxylic acid, N-methyl-1,2-phenylenediamine and Zinc di[bis(trifluoromethylsulfonyl)imide] were purchased from Aldrich and freshly use without further purification.

Characterization: SEM analysis was conducted using a JEOL model JSM-6490 and TEM and EDX analysis were conducted on JEOL Model JEM-2011. The images were obtained for fracture sample surfaces. The thermal properties of samples were studied by DSC (Perkin-Elmer, Diamond DSC7 model) with a scanning rate of 10°C/min.

Shape Memory Evaluation: Shape fixity (R_f) and shape recovery (R_r) were evaluated by comparing the bending angle, fixed angle, and recovered angle. Samples were heated at 80°C and bend to 180° (bending angle) and then quenched in ice water for 1 min. The fixed angle was measured afterwards. The final angle was measured as the recovered angle.¹⁶ For UV activation, the SMP were cut into rectangular (37mm×2mm×1mm). The UV source was generated from SunSpot SM 2 from Shenzhen Wisbay M&E Co., LTD. The sample surface temperature during heating was recorded with IR camera.