Electronic Supplementary Material (ESI) for Polymer Chemistry.

Fully recoverable rigid shape memory foam based on copper-catalyzed azide-alkyne cycloaddition (CuAAC) using a salt leaching technique

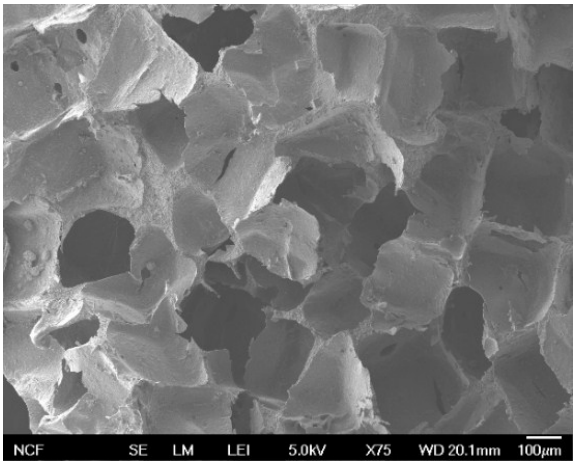

Figure S1: SEM image of the CuAAC foam. The scan was performed with acceleration voltage of 5.0kV, working distance of 20.1mm, and magnifications of 75×.

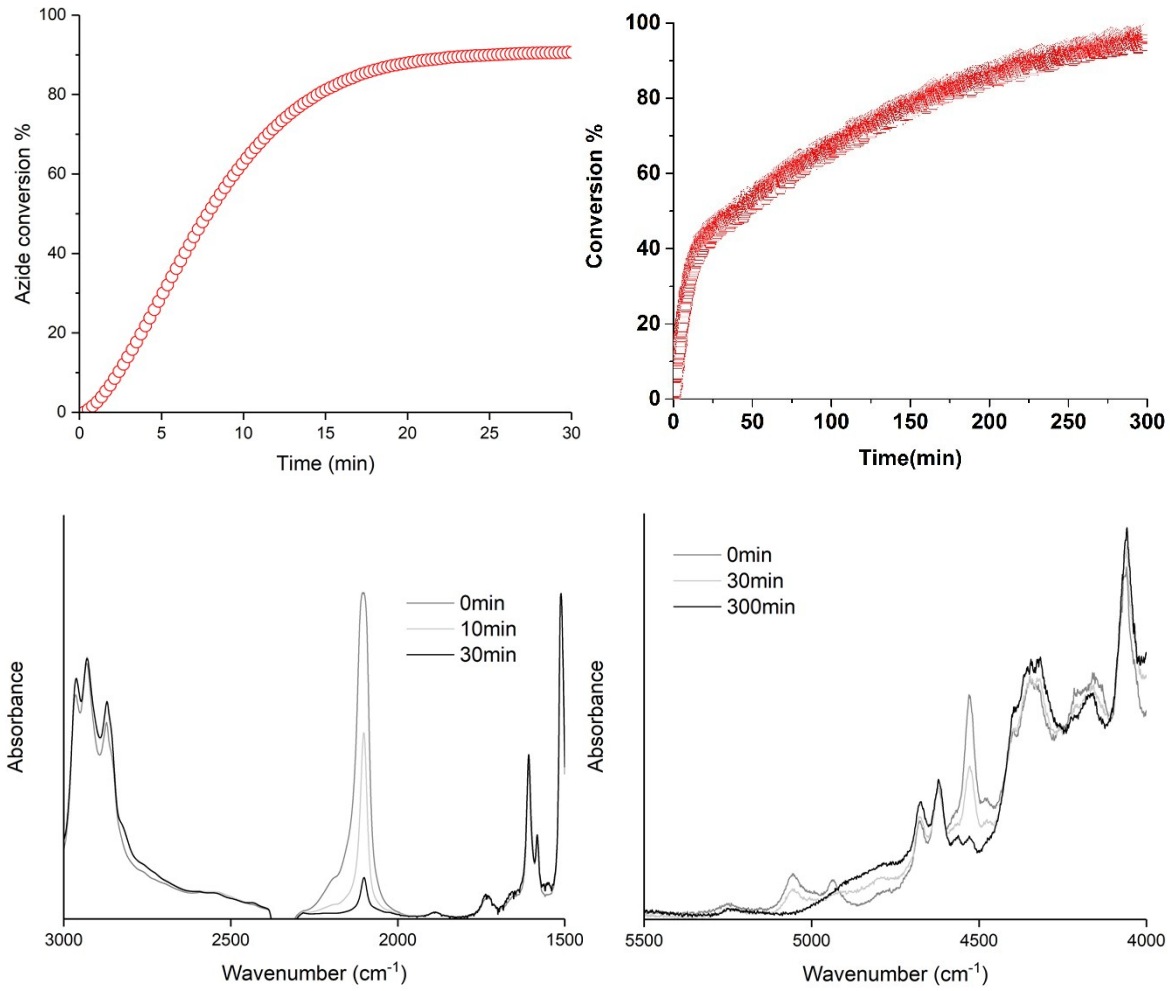

Figure S2: FT-IR *in situ* kinetic measurement of the CuAAC non-foam polymer (top left) and the epoxy-amine non-foam polymer (top right). CuAAC non-foam polymer consisted of a 50:50:1 azide:alkyne: $CuCl_2$/PMDTA ratio based on the moles of functional groups was mixed with a few drops of methanol to obtain a homogenous mixture, and methanol was removed *in vacuo*. Hexylamine, 8 wt% with respect to monomer, was added to the mixture, and the mixture was placed between two sodium chloride crystals using a spacer with a thickness of 65 µm. The disappearance of the azide peak at 2100 cm^{-1} was monitored (bottom left). Epoxy-amine non-foam polymer consisted of a 1:0.5:0.5 ratio of bisphenol A diglycidyl ether, 1,6-diaminohexane, and aniline ratio based on the moles of functional groups was heated to obtain a homogenous

mixture. The mixture was placed between two glass slides using a rubber spacer with a thickness of 1 mm and heated to 100 ˚C for 5 hours using a heating stage that was placed inside the IR chamber. The disappearance of the C-H stretching at 4530 cm^{-1} was monitored (bottom right).

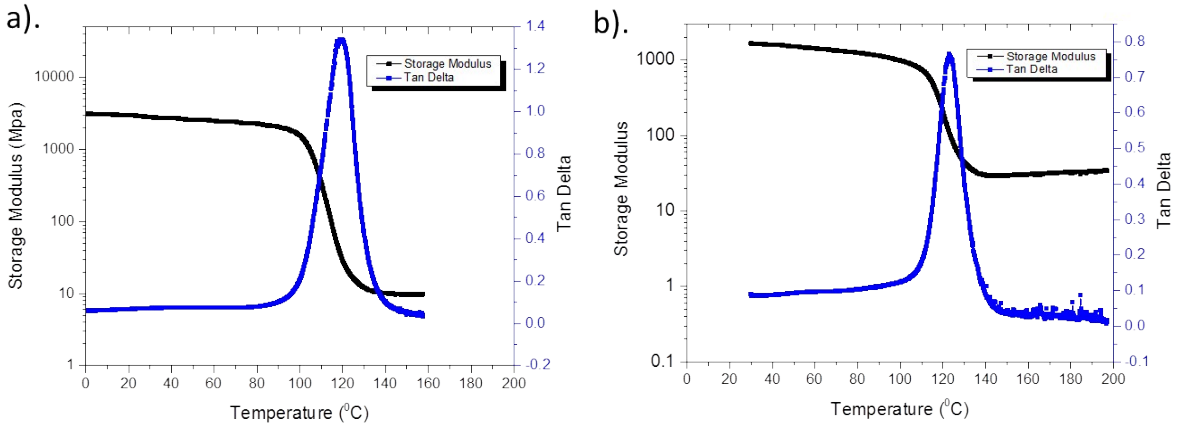

Figure S3: Glass transition temperature, T_g, and storage modulus of a CuAAC non-foam polymer (a) and epoxy-amine non-foam polymer (b) were measured via DMA. CuAAC non-foam polymer consisted of a 50:50:1 azide:alkyne: $CuCl_2$/PMDTA ratio based on the moles of functional groups with 8 wt % hexylamine shows a narrow glass transition peak with a T_g = 120 ˚C, and a rubbery modulus = 9.8 MPa. Epoxy-amine non-foam polymer consisted of a 1:0.5:0.5 ratio of bisphenol A diglycidyl ether, 1,6-diaminohexane, and aniline ratio based on the moles of functional groups shows a narrow glass transition peak with a T_g = 120 ˚C and a rubbery modulus = 32.0 MPa.

Figure S4: The CuAAC foam after 5 successive compression cycles to 80% strain.

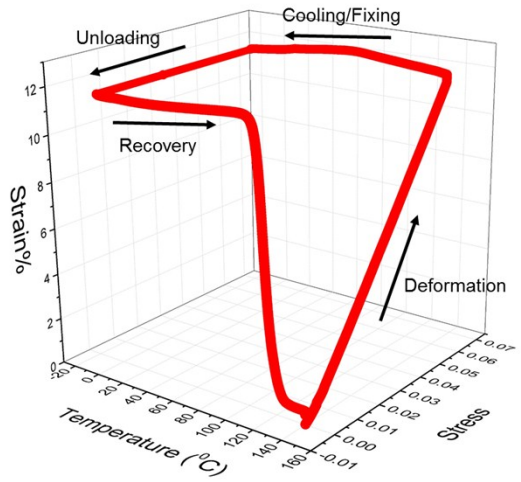

Figure S5: Tensile shape memory behavior of 1mm CuAAC foam consisted of a 50:50:1 azide:alkyne: $CuCl_2$/PMDTA ratio based on the moles of functional groups with 8 wt % hexylamine. The sample was strained to 11% at 140 ˚C and was subsequently cooled to -10 ˚C to fix the shape. The applied stress was then unloaded at -10 ˚C (R_f = 99%) and was heated up to 140 ˚C to determine its shape recovery behavior (R_r = 99%).