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: CuCl₂/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 ($R_r = 99\%$).