Supporting Information

Strong and Efficient Self-healing Adhesive Based on Dynamic Quaternization Cross-links

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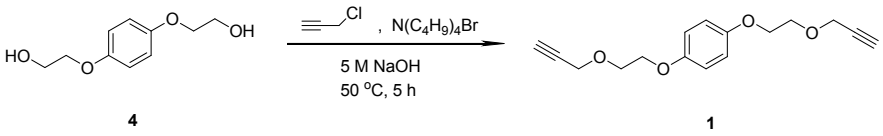

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Scheme S1. Synthesis of 1,4-bis(2-(prop-2-yn-1-yloxy)ethoxy)benzene **1**.

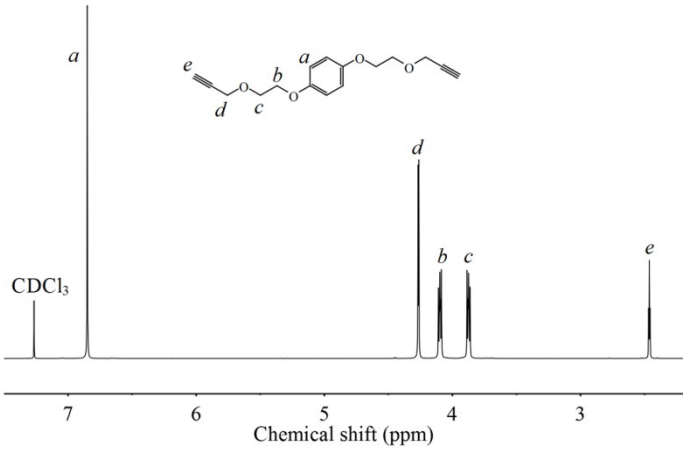

Figure S1. ^{1}H NMR spectrum for **1** in $CDCl_3$.

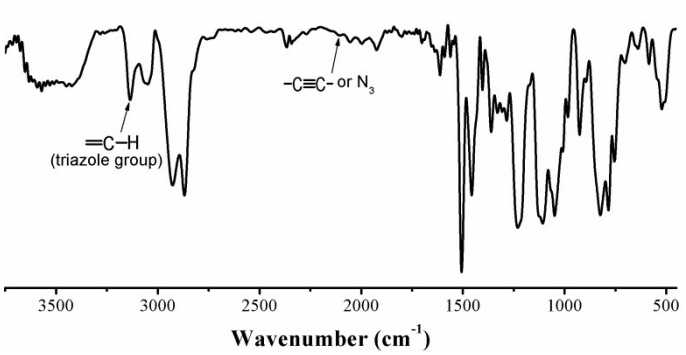

Figure S2. FTIR spectrum of the VPTA membrane. The peak of "acetylenic bond or N_3"could be hardly found out, which means that the alkinyl and azide group have been reacted completely in the VPTA membrane.

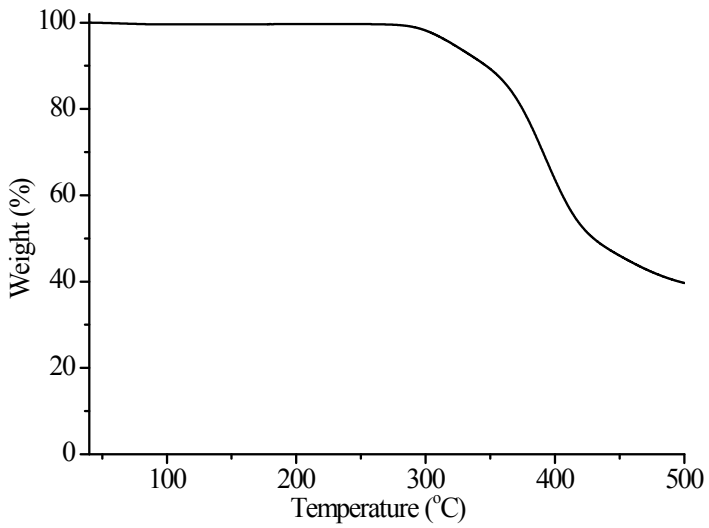

Figure S3. TGA curve of the VPTA membrane.

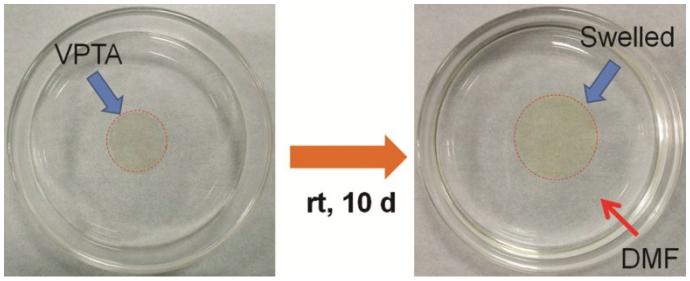

Figure S4. Photograph of the VPTA membrane before and after immersing in DMF at room temperature for 10 d. The circular VPTA membrane is outlined with red dotted lines for clarity, because its color is very light.

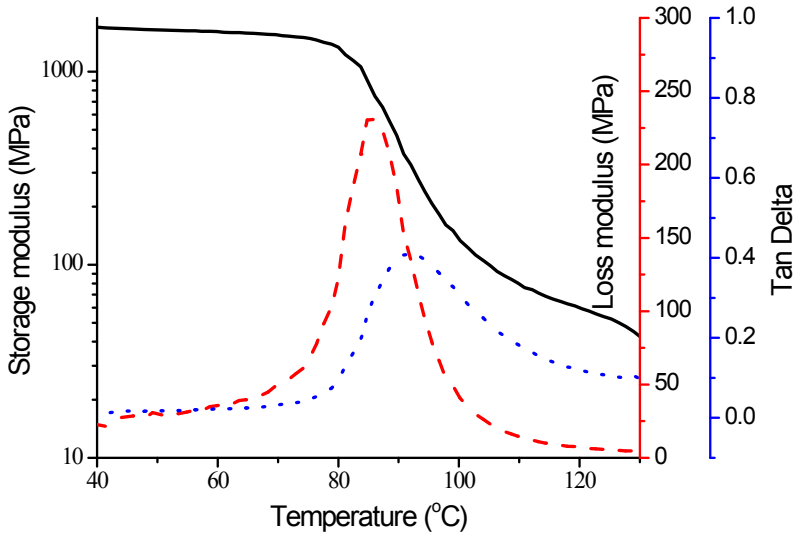

Figure S5. DMA curves of the VPTA membrane (—storage modulus ----loss modulus ····· tan delta).

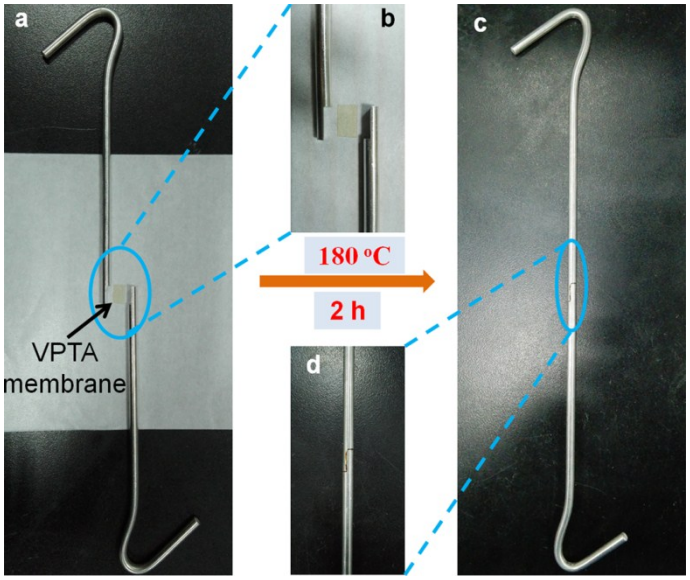

Figure S6. Adhesion process of aluminum alloy rods. The panel (a) and (c) is the enlarged image of (b) and (d), respectively. The two parts of aluminum alloy rods were bonded together through heat treatment, after sandwiching the adhesive membrane between them.

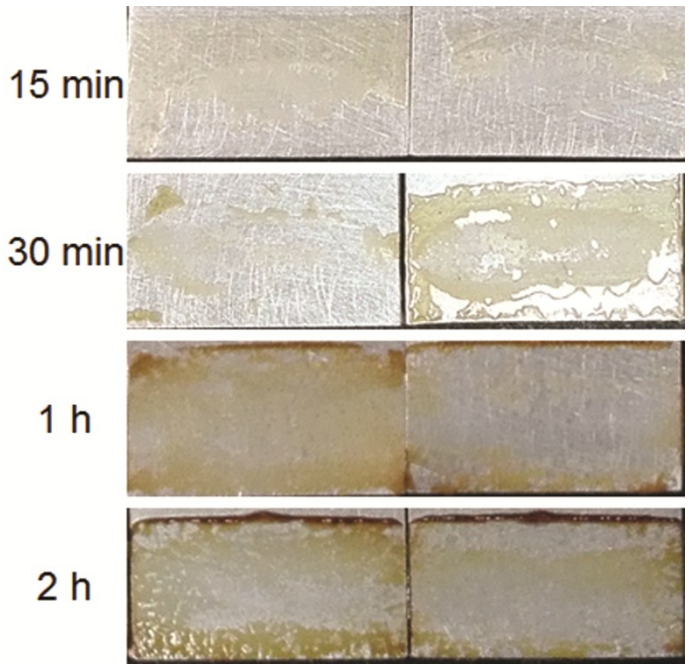

Figure S7. Failure pictures of the VPTA adhesive joint fabricated at 200 °C for different times. At the early stage of adhesion (15 min), only the central region of adhesive had been bonded on the adherends, and the rest part was still film-like without sticking. With the adhesion precede (30 min), bonded area of adhesive increased through plastic flow of the adhesive membrane. When the adhesive joint was fabricated at 200 °C for 1 h, almost all of the adhesive membrane had been bonded on the adherends. When the adhesion time increased to 2 h, the resin flowed out of the adhesion area.

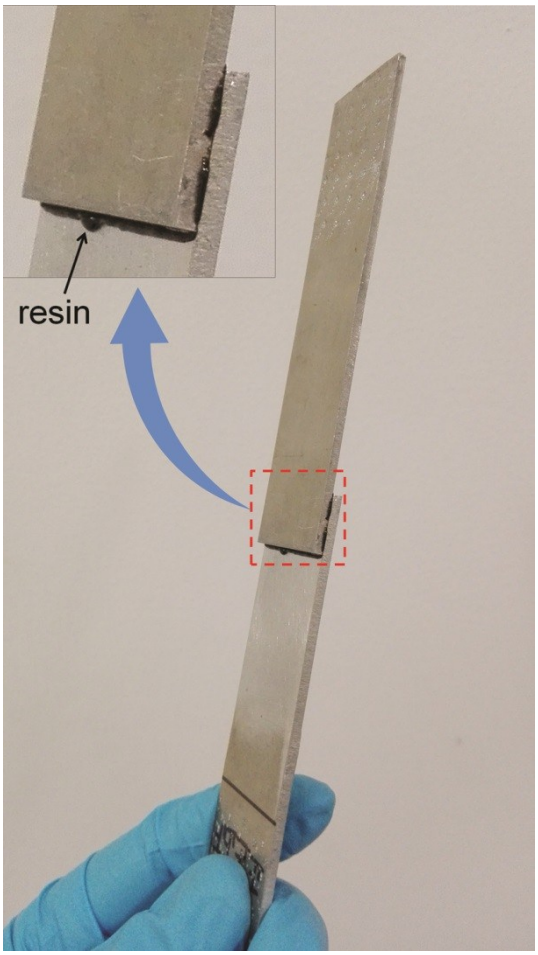

Figure S8. The repaired adhesive joint specimen after the 18th repair cycle. The inset represents the enlarged image of the adhesive joint. The deep brown object is the VPTA resin flowed out in the past 18 repair cycles.

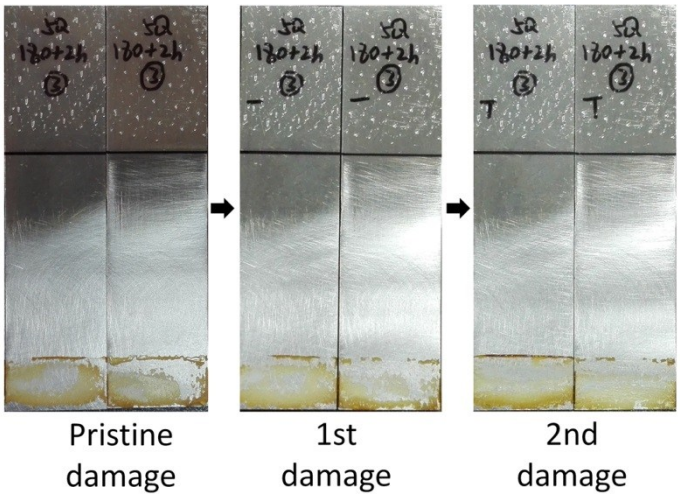

Figure S9. The failure pictures of VPTA adhesive joints after the pristine, 1st, and 2nd damage.