UV-responsive pressure sensitive adhesive for damage-free fabrication of ultrathin imperceptible mechanical sensor with ultrahigh optical transparency

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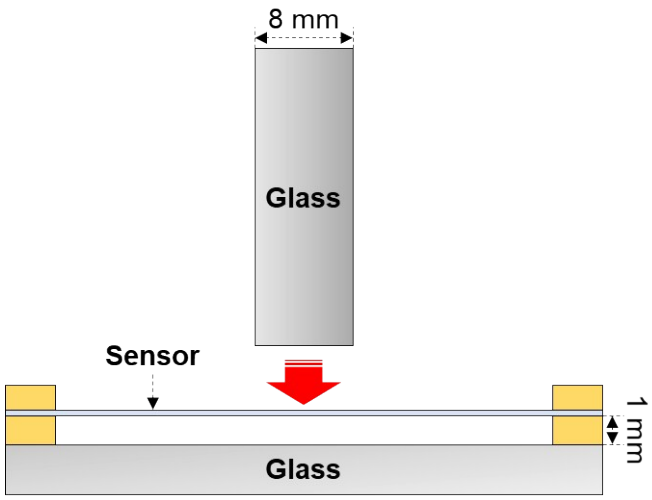

Fig. S1. Schematic setup of the pressing test.

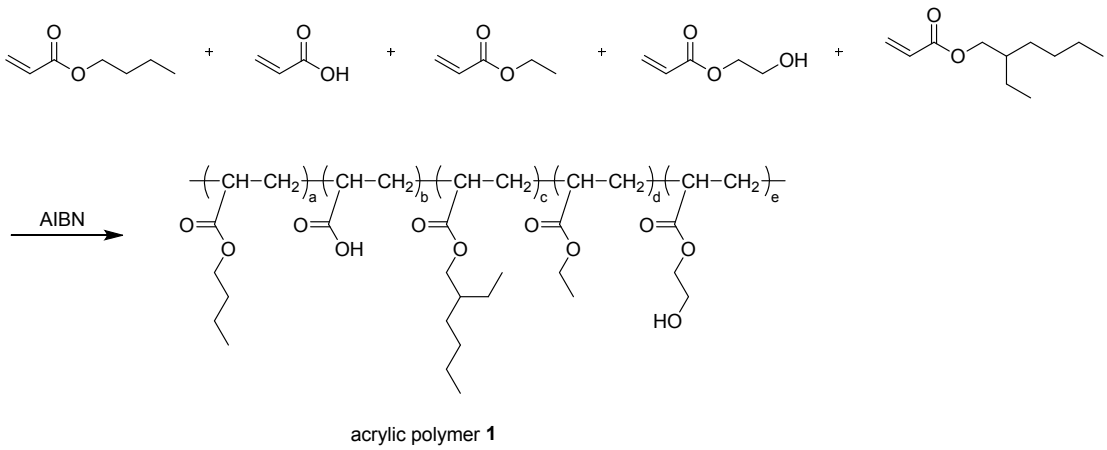

Fig. S2. Synthesis of acrylic polymer **1**.

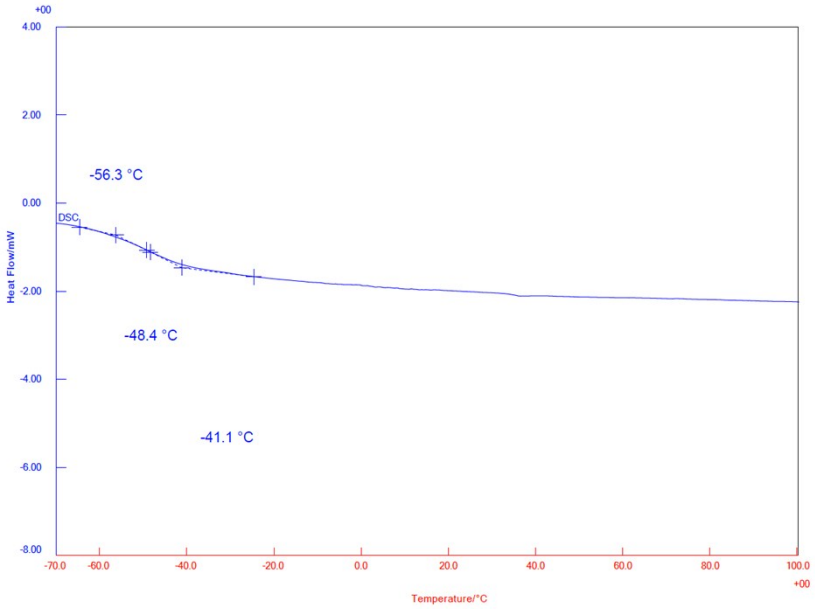

Fig. S3. DSC curve for acrylic polymer **1** measured in the range -70 °C to 100 °C.

monomers	2-ethylhexyl acrylate	butyl acrylate	ethyl acrylate	2-hydroxyethyl acrylate	acrylic acid
Mass fraction	0.300	0.439	0.200	0.001	0.060
Tg (K)	223	219	249	258	378

$$\frac{1}{Tg} = \frac{0.300}{223} + \frac{0.439}{219} + \frac{0.200}{249} + \frac{0.001}{258} + \frac{0.060}{378}$$

Tg = 232 K -> Tg = -41 ^{o}C

Fig. S4. Calculation of T_g by Fox equation.

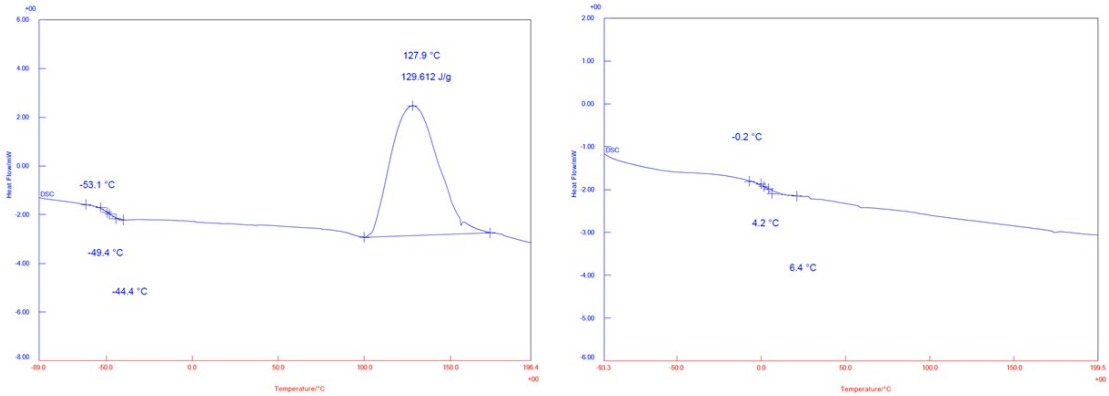

Fig. S5. DSC curves for polyurethane acrylate **2** during (left) the first heating cycle and (right) second heating cycle.

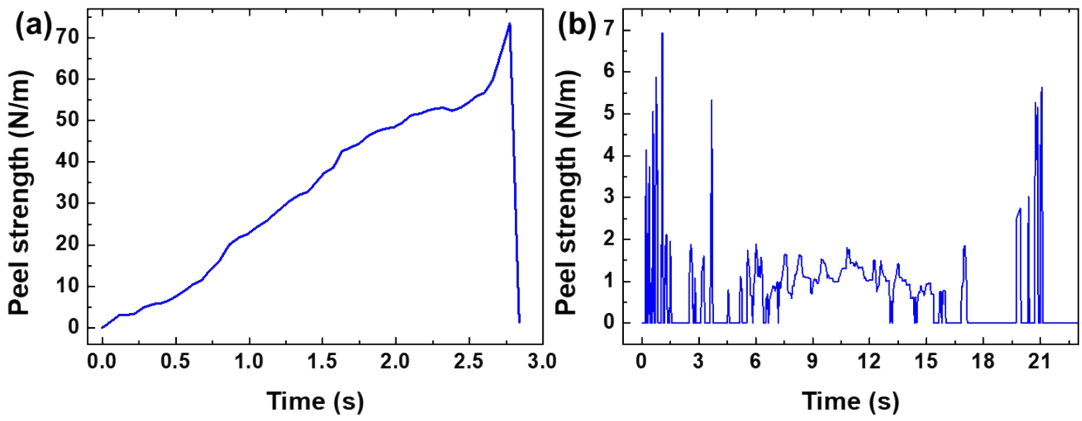

Fig. S6. Strength-time curves of UVC-PSA tapes obtained with loop tack test (left) before and (right) after UV irradiation.

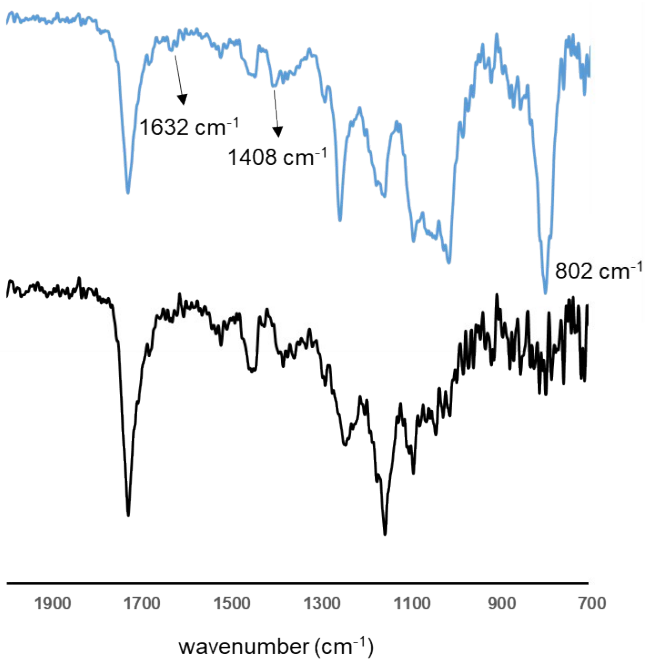

Fig. S7. FTIR spectra of the UVC-PSA tape (top) before and (bottom) after UV treatment.

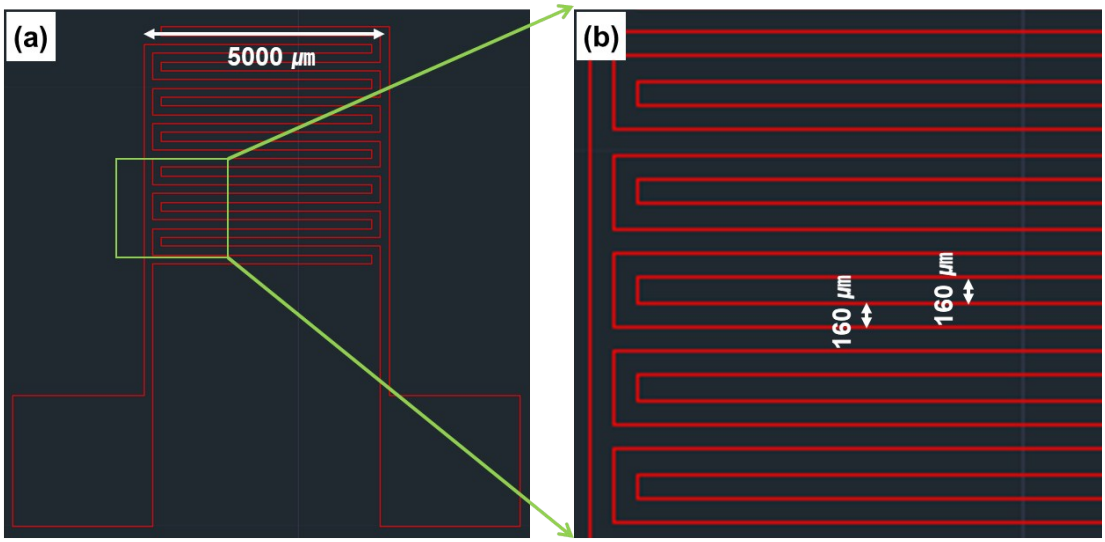

Fig. S8. (a) Capacitor design for the pressure sensor and (b) enlarged view of the boxed region in (a).

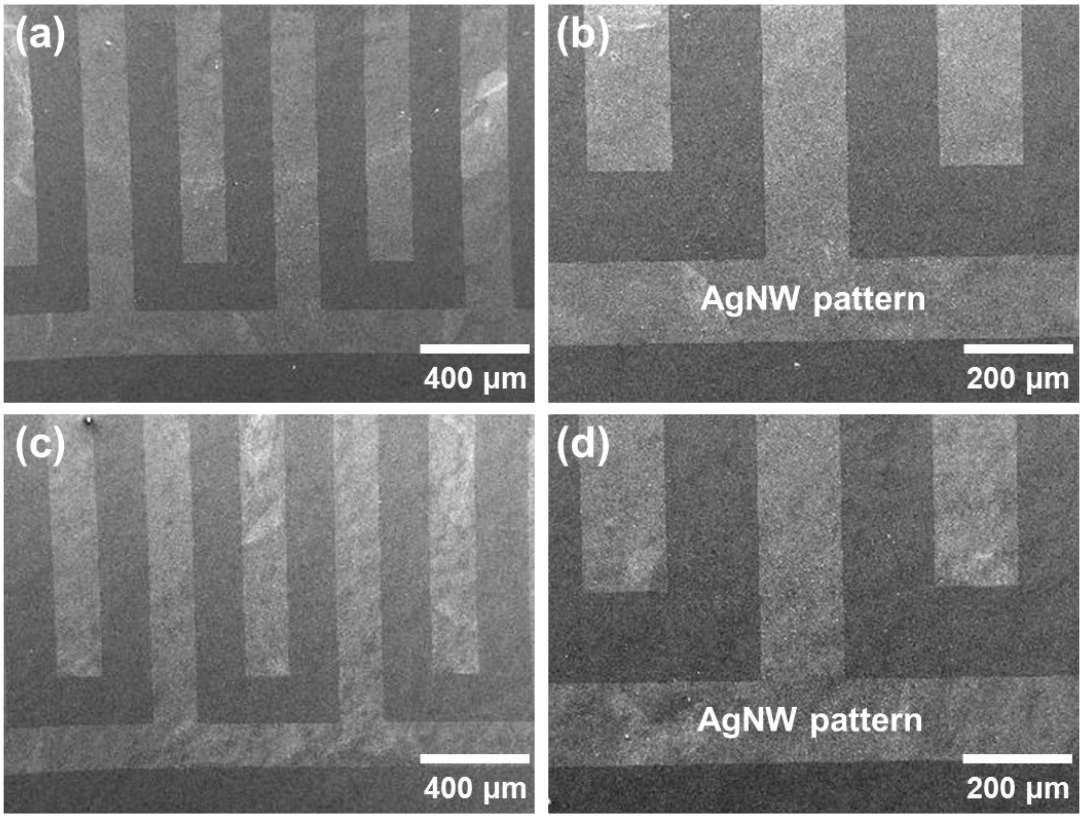

Fig. S9. (a), (b) AgNW circuits patterned according to a tandem compound electrode on a 1.4-μm-thick PET before peeling from a carrier substrate. (c), (d) Those after peeling from the carrier with UV irradiation.

In order to form the tandem compound pattern using the AgNWs, high-precision AgNW patterning was required. Fortunately, because of the hydrophilic nature of the PET surface, the adhesion with AgNWs was sufficient to employ photolithography and etching to make a patterned AgNW structure. Figs. S9(a) and S9(b) show the patterned AgNWs on a 1.4-μm-thick PET/UVC-PSA/thick PET, which was designed to generate the capacitance between the parallel AgNW-based lines. The important point here is that problems such as delamination or disconnection of AgNWs should not occur after peeling the 1.4-μm-thick PET film from the carrier substrate after the

UV irradiation, and the resistance change of AgNW circuit should not be large. No new defects were found on the AgNW pattern after peeling, as shown in Figs. S9(c) and S9(d), and the resistance change of the AgNW circuit was measured to be less than 5%.

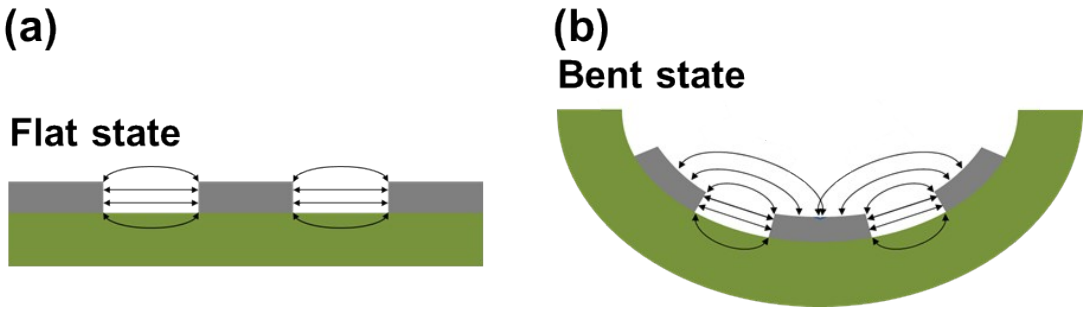

Fig. S10. Description of electromagnetic coupling between AgNW-based lines at (a) flat state and (b) bent state.

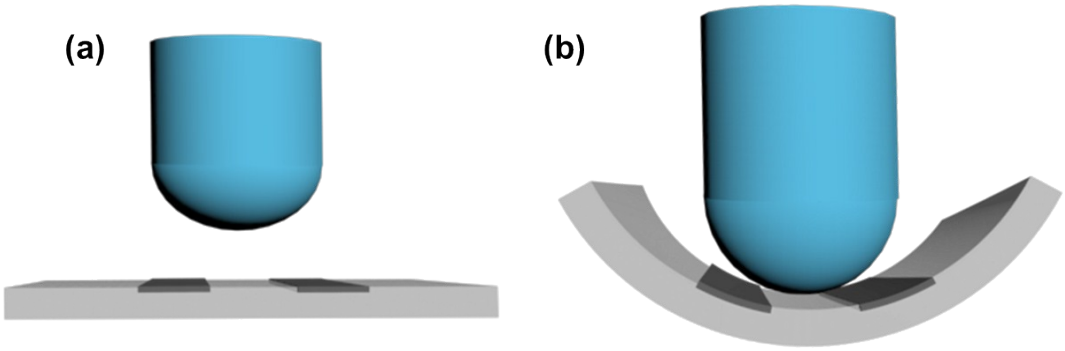

Fig. S11. Description for (a) before pressing and (b) after pressing an ultrathin sensor by a bar.