"Sticky" Fast-Curable Nano-Adhesive for Strong Adhesion on Arbitrary Substrate

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Demand of adhesives that are strong but ultra-thin with high flexibility, optical transparency is rapidly growing recently. Here, we suggest a "sticky" nano-adhesive with outstanding adhesion strength accomplished by single-side deposition of the nano-adhesive on arbitrary substrates. The "sticky" nano-adhesive is formed by a solvent-free method, initiated chemical vapor deposition (iCVD). Due to the low glass transition temperature of the copolymer (-9 °C), the ionic copolymer shows a viscoelastic behavior that makes the adhesive attachable to various substrates. Moreover, the copolymer film is thermally curable via a cross-linking reaction which substantially increased the adhesion strength of the 500 nm-thick nano-adhesive greater than 25 N/25mm within 5 min curing at 120 °C. The adhesive thickness can further be reduced to 50 nm and the nano-adhesive layer can form uniform adhesion in a large area substrate (up to 130 × 100 mm^2). Thanks to its ultra-thin nature, the nano-adhesive is also optically transparent as well as highly flexible, which will play a critical role in fabrication and the lamination of future flexible/wearable devices.