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A self-healable and mechanical toughness flexible supercapacitor based on polyacrylic acid hydrogel electrolyte

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Abstract

With overwhelming development of electronic technology, flexible electronic devices are spring up in modern today. For fulfilling the trendy and artistic designing of electronic devices, mechanical toughness and self-healable all-solid-state supercapacitors play an essential role of modern electronics. However, the sate-of-the-art polyvinyl alcohol-based electrolyte for all-solid-state supercapacitors neither has tough physical performance nor self-healing, which is hard to implant into special-shaper and repeated-deformation device for energy supplier. A novel electrolyte with mechanical robust and endowed self-healing is prepared by micelle co-polymerization of acrylic acid and octadecyl methacrylate in vinyl-treated sponge (S-PAA). The 3D interconnected skeleton of sponge serves as stress buffers to dissipate energy when physical impact (stretch and compress) is applied, solving the intrinsically poor mechanical performance and easy cracking under repeated-deformation drawbacks of state-of-the-art supercapacitors. The supercapacitor equipped with newly type of electrolyte can be worked under compressing, bending and stretching station. Moreover, the performances have no evidence loss even using self-