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Highly Flexible Self-Assembled V_2O_5 Cathodes Enabled by Conducting Diblock Copolymers HYOSUNG AN, JARED MIKE, Texas AM University, KENDALL SMITH, LISA SWANK, YEN-HAO LIN, STACY PESEK, RAFAEL VERDUZCO, Rice University, JODIE LUTKENHAUS, Texas AM University — Structural energy storage materials combining load-bearing mechanical properties and high energy storage performance are desired for applications in wearable devices or flexible displays. Vanadium pentoxide (V_2O_5) is a promising cathode material for possible use in flexible battery electrodes, but it remains limited by low Li^+ diffusion coefficient and electronic conductivity, severe volumetric changes upon cycling, and limited mechanical flexibility. Here, we demonstrate a route to address these challenges by blending a diblock copolymer bearing electron- and ion-conducting blocks, poly(3-hexylthiophene)-*block*-poly(ethyleneoxide) (P3HT-*b*-PEO), with V_2O_5 to form a mechanically flexible, electro-mechanically stable hybrid electrode. V_2O_5 layers were arranged parallel in brick-and-mortar-like fashion held together by the P3HT-*b*-PEO binder. This unique structure significantly enhances mechanical flexibility, toughness and cyclability without sacrificing capacity. Electrodes comprised of 10 wt% polymer have unusually high toughness (293 kJ/m^3) and specific energy (530 Wh/kg), both higher than reduced graphene oxide paper electrodes.

Hyosung An
Texas A
M University

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