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Synergistic reinforcement of poly(vinyl alcohol) nanocomposites with cellulose nanocrystal-stabilized graphene

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ABSTRACT: Cellulose nanocrystal-stabilized graphene (**GR-CNC**) was produced by liquid phase exfoliation of graphite assisted by cellulose nanocrystals (CNC), a recently reported method that allows stabilization of resulting graphene flakes in aqueous dispersions. Using a simple and environmentally friendly process, **GR-CNC** was incorporated into poly(vinyl alcohol) (PVA) aqueous solutions to obtain PVA-based nanocomposites (**GR-CNC/PVA**) by a casting method. For comparison purposes, two reference materials were also prepared following the same procedure: **CNC/PVA** and **GR-T/PVA**, where graphene was stabilized by an organic surfactant, Triton X-100 (T). At 1wt% nanofiller loading, **GR-CNC/PVA** exhibited superior mechanical properties (improvements in tensile strength and Young's modulus were about 20% and 50%, respectively, compared with neat PVA) than **CNC/PVA** (4% increase in tensile strength and 19% in Young's modulus) and **GR-T/PVA** (where a decrease in mechanical properties

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