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# Nitrogen-Rich Two-Dimensional Porous Polybenzimidazole Network as a Durable Metal-Free Electrocatalyst for a Cobalt Reduction Reaction in Organic Dye-Sensitized Solar Cells

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## Abstract

Nitrogen-enriched two-dimensional (2D) porous polybenzimidazole (2D-HPBI) network was synthesized from the reaction between 1,2,4,5-tetraaminobenzene (TAB) and benzene-1,3,5-tricarboxylic acid (BTA) in polyphosphoric acid (PPA) medium. Interestingly, the remnant terminal groups such as amine and carboxyl groups at the periphery of 2D-HPBI were selectively stripped off by heat-treatment at 470 °C. The resultant heat-treated 2D-HPBI (HT-HPBI) displayed substantially improved electrical conductivity and thus outstanding performance as the counter electrode (CE) for the cobalt reduction reaction (CRR) in dye-sensitized solar cells (DSSCs). The charge-transfer resistance ( $R_{ct} = 0.51 \Omega \text{ cm}^2$ ) at the HT-

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