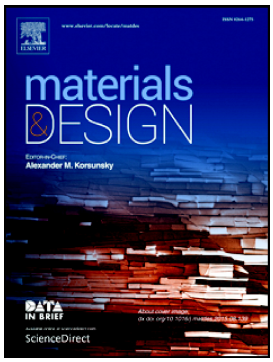

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Highly-reactive Al/CuO Nanoenergetic Materials with a Tubular Structure

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Abstract

Al/CuO nanoenergetic materials with nanotube and nanorod morphologies were prepared and investigated in this study. The CuO nanotubes and nanorods synthesized by chemical etching are homogenous on a large scale, with an external diameter in the range of 100~200 nm and typical lengths of 5~7 μm. Each of these CuO nano-arrays was deposited on nano-Al by electrophoretic deposition. Using the Brunauer Emmett Teller method, the Al/CuO nanotube composite is determined to have a larger specific surface area (43.20 m^2/g) than that of the Al/CuO nanorod composite (16.75 m^2/g). The energy released from the Al/CuO nanotubes is approximately to 3264 J/g, which is higher than that released from the Al/CuO nanorods (2013 J/g). The combustion flames for the Al/CuO nanotubes are also more rapid and violent. It is speculated that the excellent output of energy and outstanding combustion performance of the Al/CuO nanotubes could be ascribed to their tubular architecture, which has a larger specific surface area enhances the intimate contact and mass transmission between fuel and oxide.