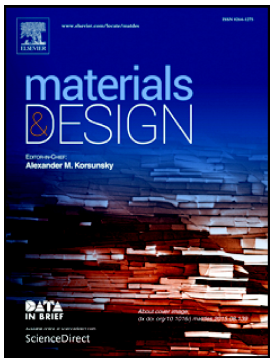

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In-situ Fabrication and Catalytic Performance of Co-Mn@CuO Core-shell Nanowires on Copper Meshes/foams

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ABSTRACT

This work reports a facile calcination-soak approach for the large-scale growth of Co-Mn composite shell over the cores of copper mesh and foam resulting in Co-Mn@CuO nanowires. In the synthesis of Co-Mn@CuO core/shell structure, CuO nanowires were first formed on copper mesh through a facile calcination, followed by Co-Mn compounds (MnO_2 and CoOOH or $Co(OH)_3$) soaking to form a coat on the outer surface of CuO nanowires attributed to the redox reaction between MnO_4^- and Co^{2+}, which were calcined in air to get the final Co-Mn oxide. The thickness of the Co-Mn oxide shell over CuO nanowire could be easily tuned by soaking duration. The prepared Co-Mn@CuO nanowires were applied as monolithic catalysts in plasma-catalytic oxidation of toluene and decomposition of ozone. The catalytic performance was enhanced to ~88 % at 1.0 A and ~95 % at 1.5 A with the filling of Co-Mn@CuO core/shell structure as monolith catalyst, which could be attributed to the synergistic effect of plasma and catalytic effect. Using Co-Mn@CuO, 95 % ozone conversion was achieved at room temperature credited to the presence of mixed-valent manganese ions in the catalyst.

KEYWORDS: VOCs; non-thermal plasma; ozone; monolith; catalytic oxidation