Surface-modified Carbon Nanotubes Catalyze Oxidative Dehydrogenation of *n*-Butane

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ABSTRACT

Butenes and butadiene, which are useful intermediates for the synthesis of polymers and other compounds, are synthesized traditionally by oxidative dehydrogenation (ODH) of *n*-butane over complex metal oxides. Such catalysts require high O_2 to butane ratios to maintain the catalyst, which heads to unwanted product oxidation. We show that carbon nanotubes (CNTs) with modified surface functionality efficiently catalyze the ODH of *n*-butane to butenes, especially butadiene. For low O_2 to butane ratios, a high selectivity to alkenes was achieved for periods as long as 100 hours. This process is mildly catalyzed by ketonic C=O groups and occurs via a combination of parallel and sequential oxidation steps. A small amount of phosphorus greatly improved the selectivity by suppressing the combustion of hydrocarbons.

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