Abstract Submitted
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Plasma-Catalytic Oxidation of n-Butane over α-MnO_2 in a Temperature-Controlled Twin Surface Dielectric Barrier Discharge Reactor[1] NIKLAS PETERS, LARS SCHÜCKE, KEVIN OLLEGOTT, CHRISTIAN OBERSTE-BEULMANN, PETER AWAKOWICZ, MARTIN MUHLER, Ruhr Univ Bochum — Volatile organic compounds (VOCs) are detrimental for the environment. Therefore, an efficient removal of VOCs from exhaust gases is necessary. The removal by plasma-assisted catalysis may be a promising replacement for energy-demanding techniques. Dielectric barrier discharges (DBDs) have already shown promising results for VOC conversion in atmospheric pressure plasmas. A combination of plasma with well-known oxidation catalysts can lead to synergistic effects. The applied twin surface DBD geometry has the advantage of a thin catalyst layer which can be deposited in a well-controlled distance to the plasma-ignited area. The thermal oxidation of n-butane has been performed in synthetic air (20.5% O_2, 79.5% N_2) over MnO_2 as catalyst up to 450 °C. MnO_2 achieves conversion of 5% at 180 °C and 95% at 319 °C with closed carbon balance. For the plasma operation n-butane was oxidized in synthetic air. Degrees of conversion of up to 36% without catalyst and 46% with mask-coated catalyst were reached. The presence of the catalyst increased both CO_2 selectivity and carbon balance. By heating the reactor to 140 °C in the presence of the catalyst, conversion increased further to 58% demonstrating synergistic plasma-catalyst interactions.

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