

The effects of oxygen injection on the behavior of a DBD plasma reactor for coupling of methane

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In this study, three cases of non-oxidative coupling of methane (NOCM), coupling of methane with continuous oxygen flow (CM-cO), and coupling of methane with pulsed injection of oxygen in the feed (CM-pO) were conducted in a dielectric barrier discharge (DBD) plasma reactor. In all the cases, α -Al₂O₃ was used as a packing material and the average volumetric flowrates of oxygen and methane during one cycle were adjusted to be equal. In the case of NOCM, methane conversion was noticeably decreased due to the carbonaceous deposit, whereas the conversion was maintained in the cases of CM-cO and CM-pO. In the case of CM-pO, the highest yield of C₂-C₄ hydrocarbon products was observed, whereas the yield of by-produced CO_x was lower than the case of CM-cO. Due to the oxygen flow and the plasma discharge, TG/DTA results showed that the amount of carbon deposition on the spent material was significantly decreased in the cases of oxygen injection.