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Optimization of ethylene yield in oxidative coupling of methane over Li/MgO catalyst

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The effects of operating temperature, inlet oxygen concentration, and F/W on ethylene production by oxidative coupling of methane (OCM) were studied over Li/MgO (Li/Mg = 0.1) catalyst. Central composite experimental design (CCD) and response surface methodology (RSM) were utilized to determine the best operating condition for maximum ethylene production. The design led to three surface responses describing the dependence of methane conversion, ethylene yield, and ethylene selectivity on operating temperature (737-913 °C), inlet oxygen concentration (6.2-23.8 vol%) and F/W (9280-35720 ml/g·hr). The equation models were tested with analysis of variance with 95% degree confidence. The results of the analysis revealed that the equation models fitted well with the experimental results for methane conversion and ethylene yield. Numerical results indicated the maximum ethylene yield was 8.14% at optimum operating temperature = 839.51˚C, inlet oxygen concentration = 18.89 vol% and F/W = 20,264.34 ml/g·hr. Additional experiments were carried out at the optimum condition for verification.