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Simultaneous optimization of methane conversion and aromatic yields by catalytic activation with ethane over Zn-ZSM-11 zeolite: The influence of the Zn-loading factor

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Experiment design-response surface methodology (RSM) is used in this work to model and optimize two responses in the process of activation of methane (C1) using ethane (C2) as co-reactant into higher hydro- carbons, over Zn-containing zeolite catalysts. The application of this methodology provides insights into a more comprehensive understanding of the influence attributed to from the different factors. In this study we analyze the influence of the C1 molar fraction (C1/C1 + C2), the reaction temperature and the Zn-loading factors. The responses analyzed were as follows: Y1: C1 conversion (mol% C) and Y2: aromatic hydrocarbon yields (mol% C). The response surfaces were obtained with the Box–Behnken Design, finding the best combination between the reaction parameters that allowed optimizing the process. By applying the statistic methodology, the higher levels of the two objective functions, C1 conversion of 48.6 mol% C and aromatic yields of 47.2 mol% C, were obtained employing, a higher temperature, 0.2–0.4 molar frac- tion of C1 and the catalysts with a higher Zn^{2+} content.