

Editorial

Selected Papers from the 2nd Edition of Global Conference on Catalysis, Chemical Engineering and Technology (CAT 2018)

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The present Special Issue concerns the papers which have been presented at the second edition of the Global Conference on Catalysis, Chemical Engineering & Technology (CAT 2018) that promote linkage of the catalytic science, engineering and technology. The topics of the conference have covered various aspects of catalysis in all of its diversity, as well as other areas on the boundaries such as environmental protection, energy, sustainability, green chemistry, fine chemistry, biotransformation, surface chemistry and enzyme and microbial technology.

Sadek et al. [1] studied cobalt based catalysts supported on two kinds of beta zeolite for application in Fischer–Tropsch Synthesis. Co-containing beta zeolite catalysts prepared by wet impregnation and two-step postsynthesis method were investigated. The activity of the catalysts was examined in Fischer–Tropsch synthesis, performed at 30 atm and 260 °C. The physicochemical properties of all systems were investigated by means of XRD, in situ XRD, temperature programmed desorption of NH₃, XPS, temperature programmed reduction of H₂ and TEM. Among the studied catalysts, the best results were obtained for the samples prepared by two-step postsynthesis method, which achieved CO conversion of about 74 % and selectivity to liquid products of about 86%. The distribution of liquid products for Red-Me-Co₂₀Beta was more diversified than for Red-Mi-Co₂₀Beta. Significant influence of the zeolite dealumination of mesoporous zeolite on the catalytic performance was observed in FTS. In contrast, for microporous catalysts the dealumination did not play such a significant role and the relatively high activity was observed for both non-dealuminated and dealuminated catalysts. The main liquid products of FTS on both mesoporous and microporous catalysts were C₁₀–C₁₄ isoalkanes and n-alkanes. The iso-/n-alkanes ratio for dealuminated zeolite catalysts was three times higher than that for not dealuminated ones, and was related to the presence of different kinds of acidic sites in both zeolite catalysts.

Nishimura et al. [2] investigated hydroxymethylation of 2-furaldehyde (furfural) toward 5-hydroxymethyl-2-furaldehyde (HMF). In this work they examined various zeolites with an aqueous formaldehyde as a reagent in a batch and a flow reactor system. It was found that the zeolite beta gave high activity and good reusability with calcination treatment before each run for the target reaction in the batch system. The unique stability of the HMF yield in the liquid-flow system was also observed only in the case of zeolite beta. The effect of the SiO₂/Al₂O₃ ratio in the zeolite beta suggested that hydrophobicity would be an important factor in faster hydroxymethylation with an aqueous formaldehyde reagent. The highest turnover frequency (TOF) for HMF production was found to be 2.4 h⁻¹ in the case of zeolite beta with SiO₂/Al₂O₃ = 440 in the batch reactor system. An approximately 30% yield for HMF was achieved under optimum conditions for zeolite beta catalysts.

Stawowy et al. [3] investigated a series of cerium-based UiO-66 obtained via hydrothermal and sonochemical methods, using the same quantities of reagents (cerium ammonium nitrate (CAN), terephthalic acid (H₂BDC)) and solvents) in each synthesis. The impact of synthesis method and metal to linker ratio on the structural and textural properties of obtained UiO-66(Ce) structure defects, as well as their composition in terms of Ce⁴⁺/Ce³⁺ ratio, resulting from the missing linker and CO₂ adsorption capacity was discussed. By using typical characterization techniques and methods, such as XRD, N₂ and CO₂ sorption, TGA, XPS, and SEM, it was shown that the agitation of reacting mixture during synthesis (caused by stirring or ultrasounds) allows to obtain structures that have more developed surfaces and fewer linker defects than when MOF was obtained in static conditions. The specific surface area was found to be of minor importance in the context of CO₂ adsorption than the contribution of Ce³⁺ ions that were associated with the concentration of linker defects.

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