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Over- and Low-exchanged Co/BEA catalysts: General Characterization and Catalytic Behaviour in Ethane Ammoxidation

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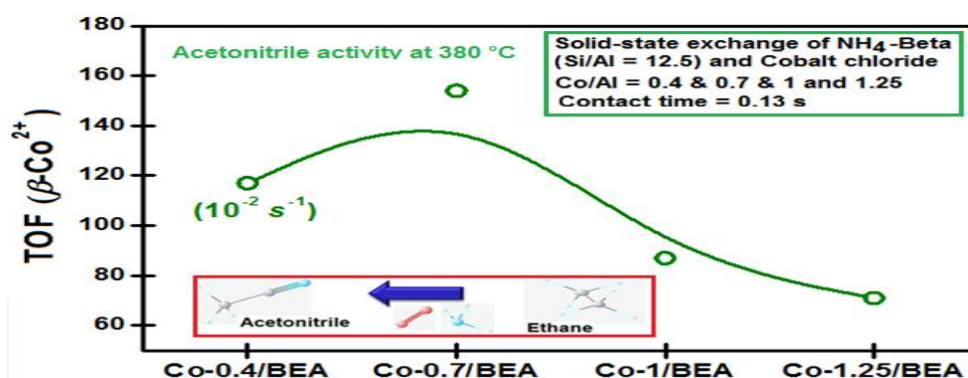
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Graphical abstract



Research highlights

- Co/BEA solids were prepared by solid-state ion exchange at different Co loads
- Co_3O_4 oxide particles inside the zeolite channels catalyze the hydrocarbon combustion
- Ethane ammoxidation is efficiently catalyzed over Beta zeolite at Co/Al = 0.75
- Co oxo $[\text{Co}(\text{III})\text{O}]^+$ species played a key role in the studied reaction

Abstract

Ethane ammoxidation into acetonitrile was successfully catalyzed between 380 and 450 °C over Co/BEA solids issued from solid-state ion exchange with different metal loads. During the preparation, in the presence of NH_4^+ -Beta zeolite (Si/Al = 12.5), CoCl_2 precursor decomposes under helium stream without evaporation, leading to the stabilization of bare Co^{2+} at the exchange cationic sites as revealed by spectroscopic tools. However, at 4.13 and 5.63 wt. % of Co (Co/Al molar ratio equal to 0.75 and 1, respectively), the corresponding solids stabilized, besides bare β -type Co^{2+} ions, Co oxo $[\text{Co}(\text{III})\text{O}]^+$ species, revealed by H_2 -TPR. These species exhibit highest catalytic activity on the

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