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

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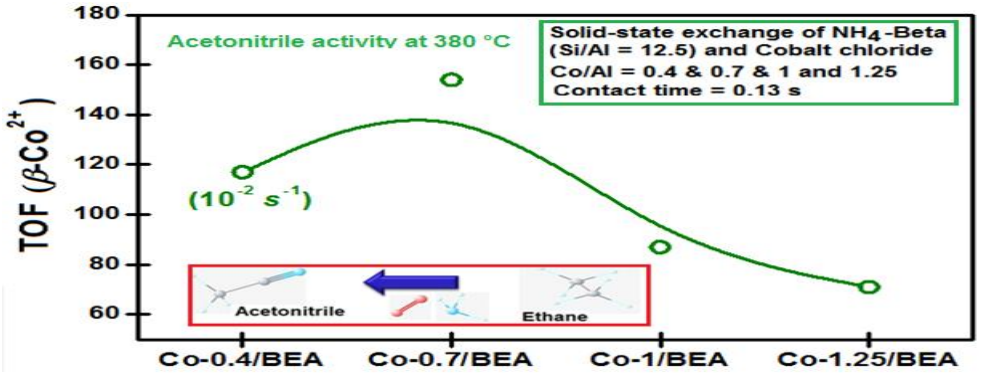
Graphical abstract



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* $[Co(III)O]^+$ 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* $[Co(III)O]^+$ species, revealed by H_2–TPR. These species exhibit highest catalytic activity on the