

## Supporting Information

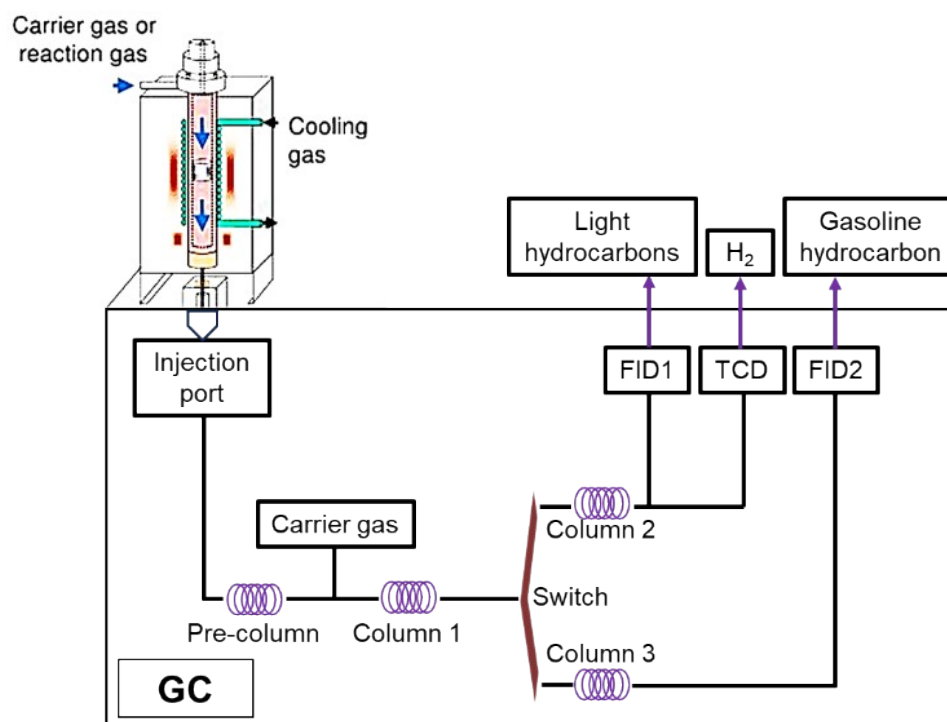
### A lost piece of puzzle on alkane cracking mechanism: a carbanion pathway on solid base catalyst

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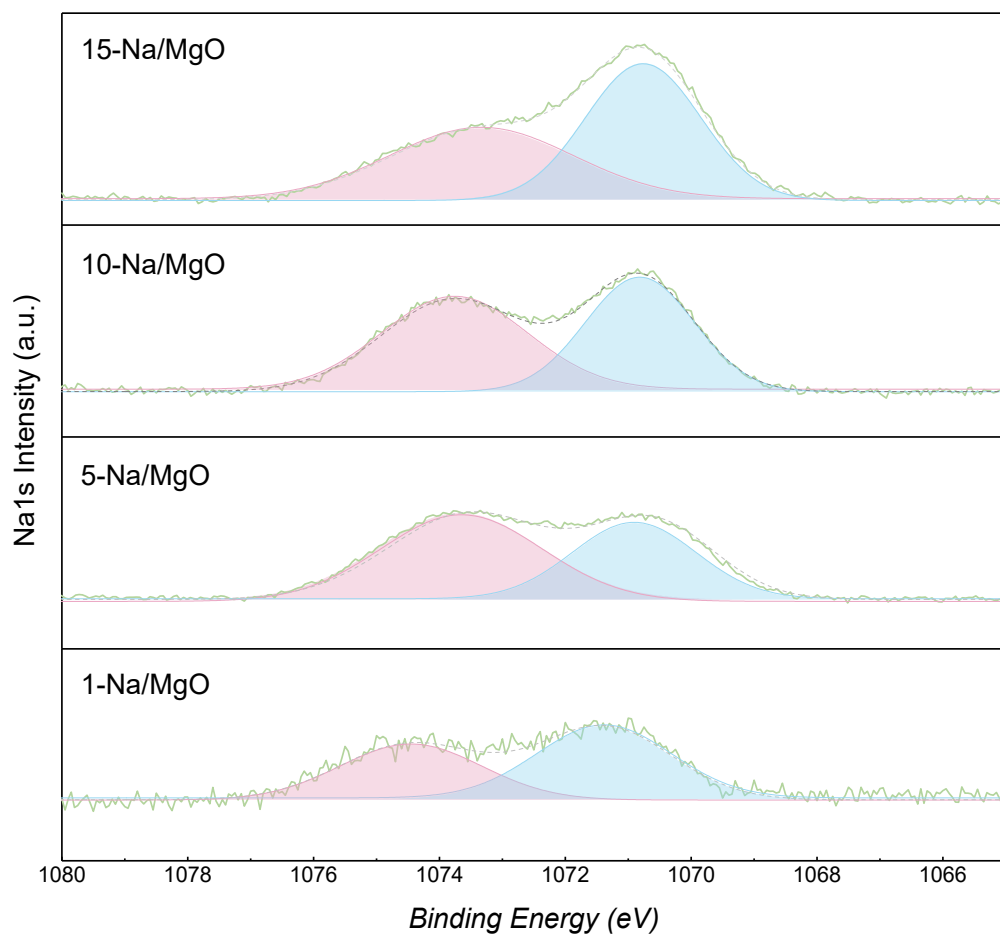
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**Table S1.** General information on indicators for measuring basic strength.

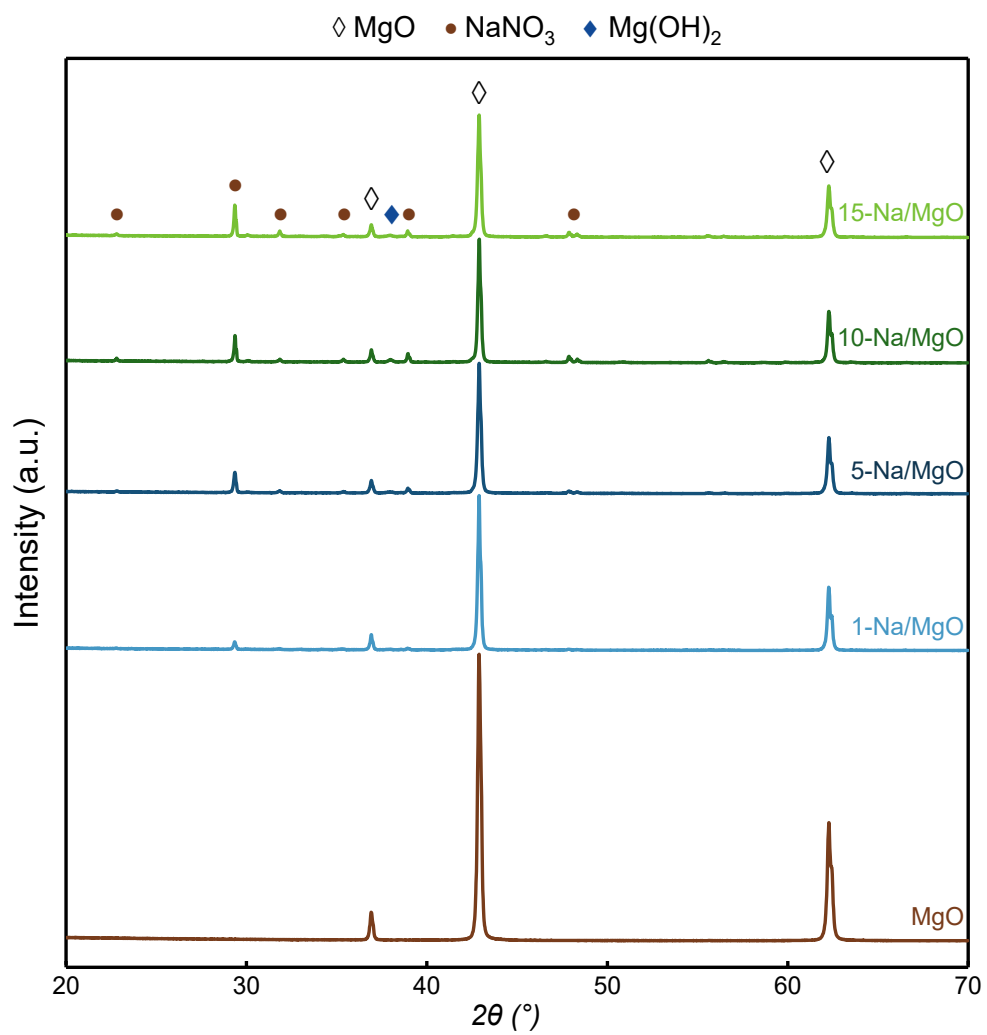
Indicators	Acid color	Base color	pK <sub>a</sub> /H.
Bromothymol blue	Yellow	Green	7.2
4-Chloro-2-nitroaniline	Yellow	Orange	17.2
4-Nitroaniline	Colorless	Orange	18.4
4-Chloroaniline	Colorless	Pink	26.5
Diphenylmethane	Colorless	Yellowish ~ orange	35



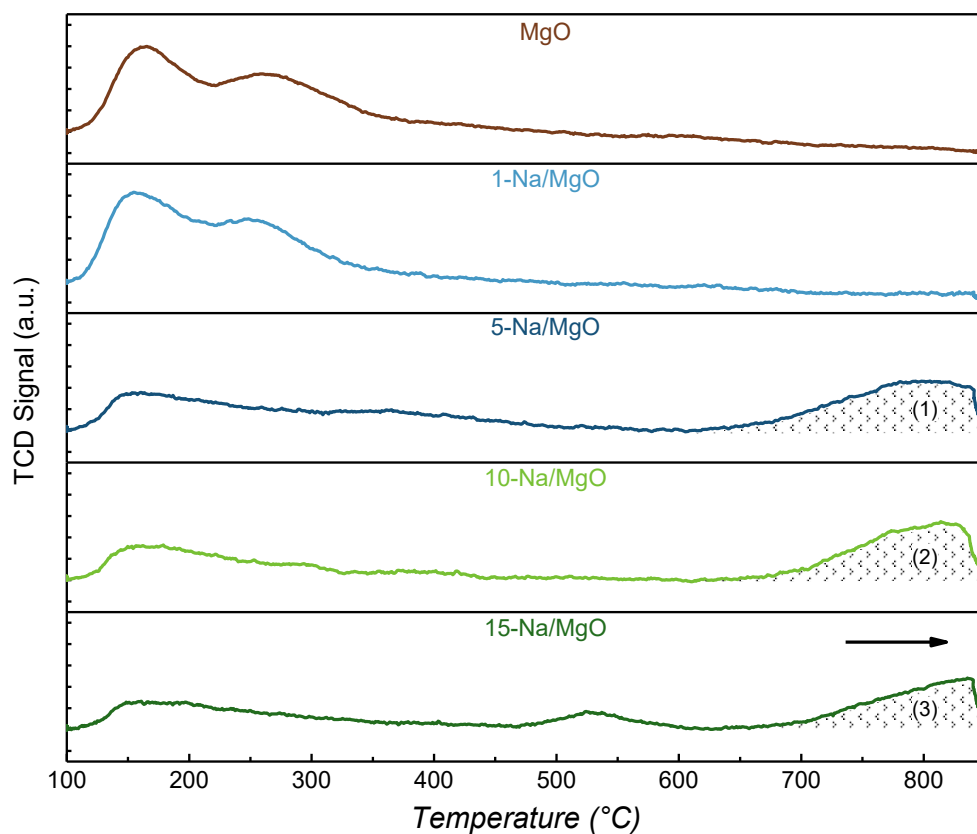
**Figure S1.** Scheme of the experimental device for catalytic performance testing of catalysts



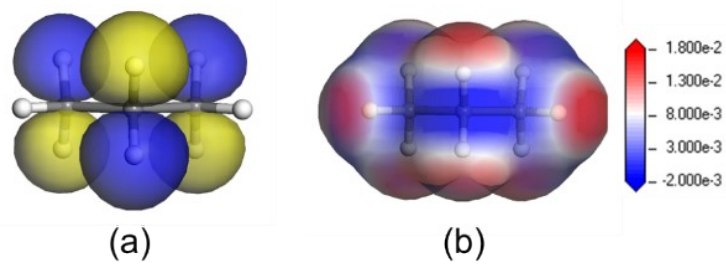
**Figure S2.** Na1s XPS spectra for series of Na/MgO samples



**Figure S3.** XRD patterns of a series of Na/MgO samples



**Figure S4.** CO<sub>2</sub>-TPD profiles of a series of Na/MgO samples



**Figure S5.** Distribution of propane molecule for (a) highest occupied molecular orbitals and (b) electric potential.