

## Supplementary material

### Improvement of low-temperature NH<sub>3</sub>-SCR catalytic performance over nitrogen-doped MO<sub>x</sub>-Cr<sub>2</sub>O<sub>3</sub>-La<sub>2</sub>O<sub>3</sub>/TiO<sub>2</sub>-N (M=Cu, Fe, Ce) catalysts

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#### 3.2 Structural characterizations of catalysts

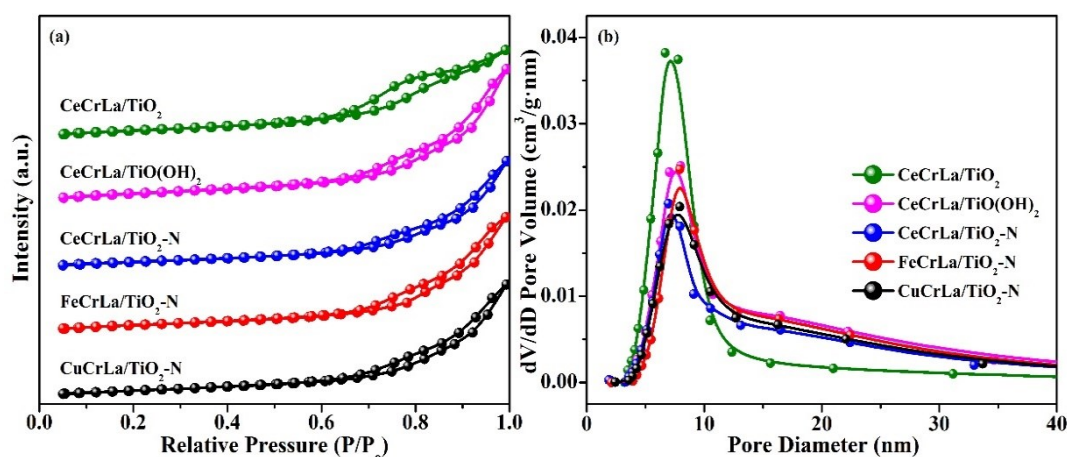


Fig. S1 (a) Nitrogen adsorption-desorption isotherms and (b) pore size distributions of the samples.

#### 3.4. H<sub>2</sub>-TPR analysis

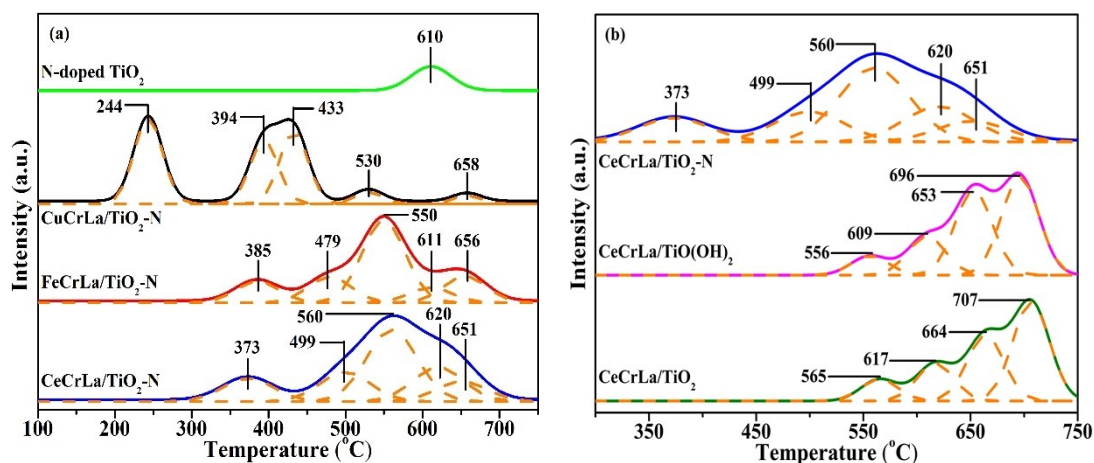


Fig. 5. H<sub>2</sub>-TPR profiles of (a) MCrLa/TiO<sub>2</sub>-N and (b) CeCrLa/Ti catalysts.

From Fig. 5(a), there are five peaks appear from 200 to 700 °C in the H<sub>2</sub>-TPR profile of

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MCrLa/TiO<sub>2</sub>-N (M=Cu, Fe, Ce). The first peak of CuCrLa/TiO<sub>2</sub>-N appeared at 244 °C can be assigned to Cu<sup>2+</sup>→Cu<sup>+</sup>. The peaks located at 350-400 °C could be attributed to Cr<sup>6+</sup>→Cr<sup>3+</sup>, the peaks at 430-500 °C referred to Cu<sup>+</sup>→Cu<sup>0</sup> (CuCrLa/TiO<sub>2</sub>-N), Fe<sup>3+</sup>→Fe<sup>2+</sup> (FeCrLa/TiO<sub>2</sub>-N), Ce<sup>4+</sup>→Ce<sup>3+</sup> (CeCrLa/TiO<sub>2</sub>-N), the fourth peak (500-600 °C) could be ascribed to Cr<sup>3+</sup>→Cr<sup>0</sup>, the peaks at 600-650 °C might be assigned as Fe<sup>2+</sup>→Fe<sup>0</sup> (FeCrLa/TiO<sub>2</sub>-N), Ce<sup>3+</sup>→Ce<sup>0</sup> (CeCrLa/TiO<sub>2</sub>-N), and the peaks at around 650 °C were attributed to Ti<sup>4+</sup>→Ti<sup>3+</sup>.