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Energy efficiency calculation

First, it is unfair to estimate energy efficiency on this simply and small installation. Even so, the energy efficiency of the process on the present installation is rather high compared with conventional thermal catalytic processes. The calculation detail is as follow:

1) The new process we proposed consisted of the adsorption stage and the discharge stage. The adsorption stage did not cost energy because this stage had no energy input or heating. The discharge stage cost energy for several minutes. At the discharge power 6.72 W and the discharge time 7min (in the cyclic process), the energy efficiency is 0.416 mmol NO*x* /W·h. Assuming that the concentration of NO_x in flue gas is 300 ppm, it is equivalent to 0.031 m^3 flue gas per W·h in the present process. Actually, the concentration of NO*x* was often lower than 300 ppm thanks to the improved combustion technology. The lower concentration, the more flue gas dealt with.

2) For the conventional thermal catalytic process, it is necessary to heat the whole flue gas from room temperature to 673K. It is equivalent to 0.009 m^3 flue gas per W·h in the conventional thermal catalytic process (Notably, an energy input of 20 $W \cdot h \cdot m^{-3}$ is equivalent to an adiabatic temperature increase of *ca.* 70 K).

3) To sum up, the energy efficiency of the new process proposed was improved three times at least, compared with the conventional thermal catalytic process.

In addition, we tried to enhance the energy efficiency further by some improvement. The absorbed NO*x* increased from 0.326 mmol to 0.652 mmol on the same quality H-ZSM-5 (1 g). Other conditions had not been changed. The NO*x* conversion could also rech 93.5%.

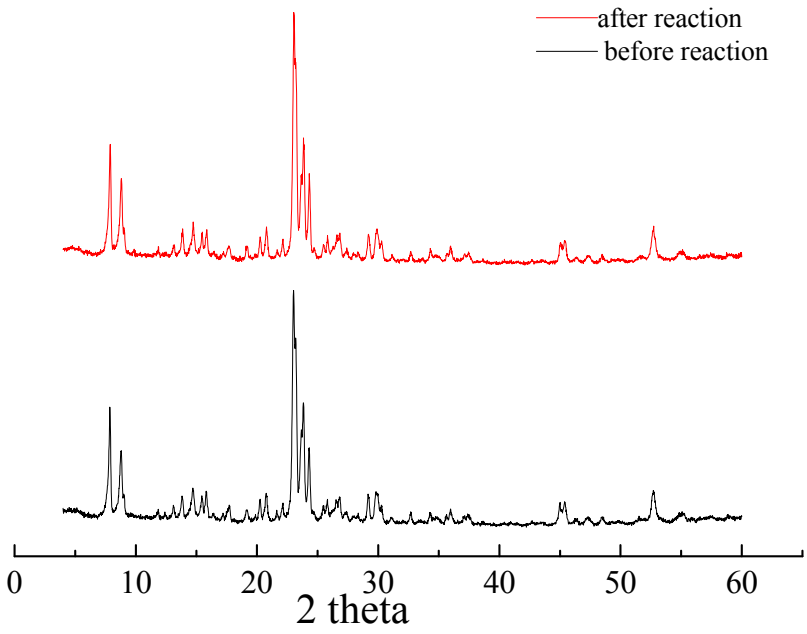

Fig 1S. XRD patterns of H-ZSM-5 before and after cyclic operation

XRD patterns of H-ZSM-5 before and after reaction displayed in supporting information (Fig. 1S) showed that H-ZSM-5 still kept the crystalline structure during the cyclic reaction, suggesting that the performance of H-ZSM-5 is stable during the Cyclic operation.