Supplementary Information

Experimental determination of the reaction order.

To determine the reaction order in respect to N₂O, the N₂O decomposition was studied varying concentrations of N₂O (2.0, 1.3, 1.0 and 0.75 %) at the total gas flow rate constant. Finally, the concentration was adjusted again to 2.0% to check the reproducibility of the experiment and the catalyst stability. The result for 573 K is presented in Figure S1 showing little influence of N₂O concentration on the rate. The amount of catalyst has been adjusted to obtain a conversion < 15% allowing to consider the reactor as differential.

\[
\frac{dC_{N_2O}}{dt} \equiv \frac{C_{N_2O, in} - C_{N_2O, out}}{\tau} \quad (\text{eq. S1})
\]

\[
r = kC_{N_2O}^n \quad (\text{eq. S2})
\]

\[
C_{N_2O, in} - C_{N_2O, out} = k\tau \cdot C_{N_2O}^n \quad (\text{eq. S3})
\]

\[
\ln \left( \frac{C_{N_2O, in} - C_{N_2O, out}}{C_{N_2O}} \right) = \ln (k\tau) + n \ln \left( C_{N_2O} \right) \quad (\text{eq. S4})
\]

Reaction order has been determined using (eq. S1) by a linear fitting of \(\ln(C_{N_2O, in} - C_{N_2O, out})\) as function of \(\ln(C_{N_2O})\) [mol.s⁻¹].
SI Figure captions

Figure S1: N₂O, N₂, O₂ and Ar inlet and outlet concentrations monitored during the N₂O decomposition over HZSM-5_{1200Fe:40Si/Al} catalyst at 573 K under steady state conditions

Figure S2: Rate of N₂O decomposition as a function of N₂O concentration at 573 K on HZSM-5_{1200Fe:40Si/Al}