Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supplementary data

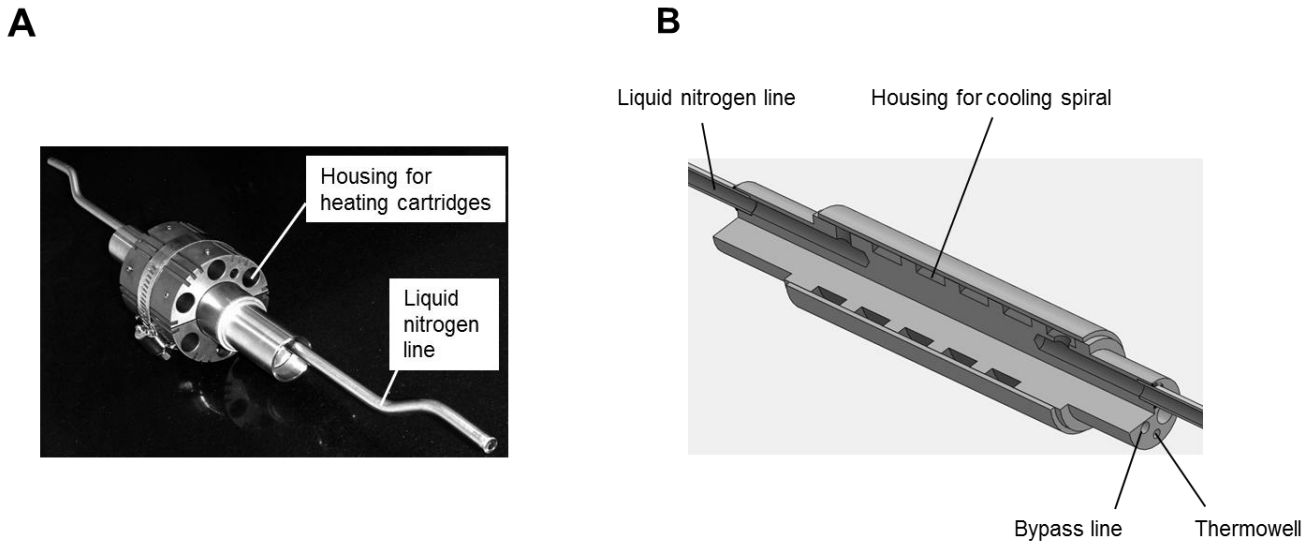

Figure S1 - Panel A: Annotated photo showing the designed microreactor exterior, Panel B: Annotated schematic of the cooling structure of the microreactor interior.

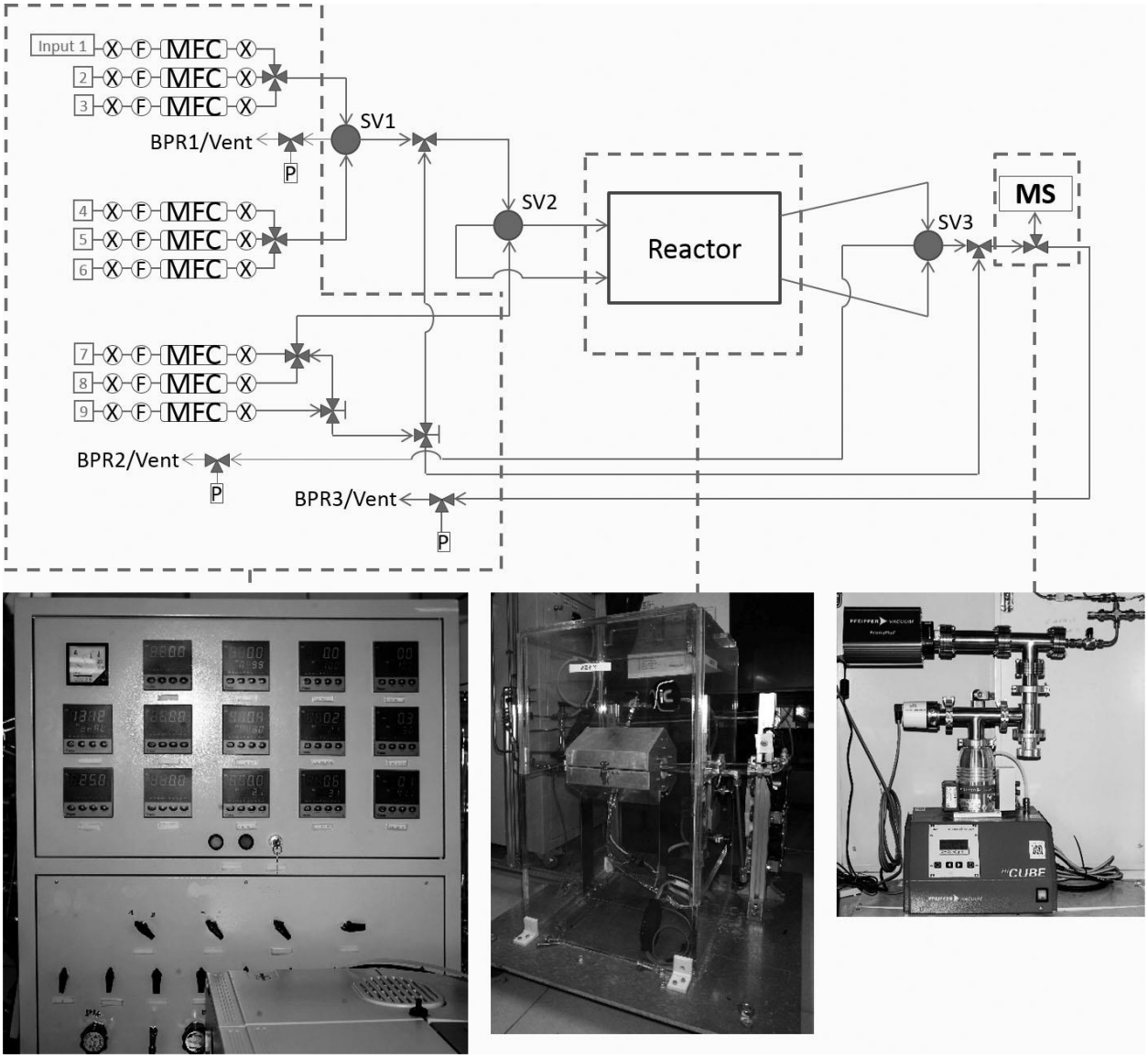

Figure S2. Full schematic of the experimental apparatus, including the gas and pressure control system, the purpose-built microreactor (with liquid nitrogen cooling), and the MS detector.

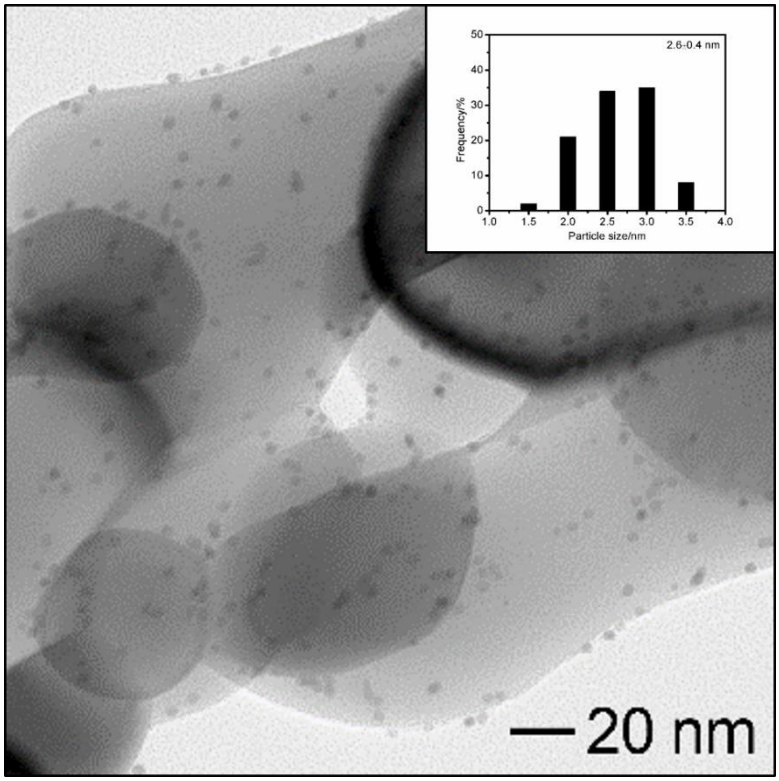

Figure S3. TEM of Pt/Fe_2O_3 sample. Inset: Histogram showing particle size distribution

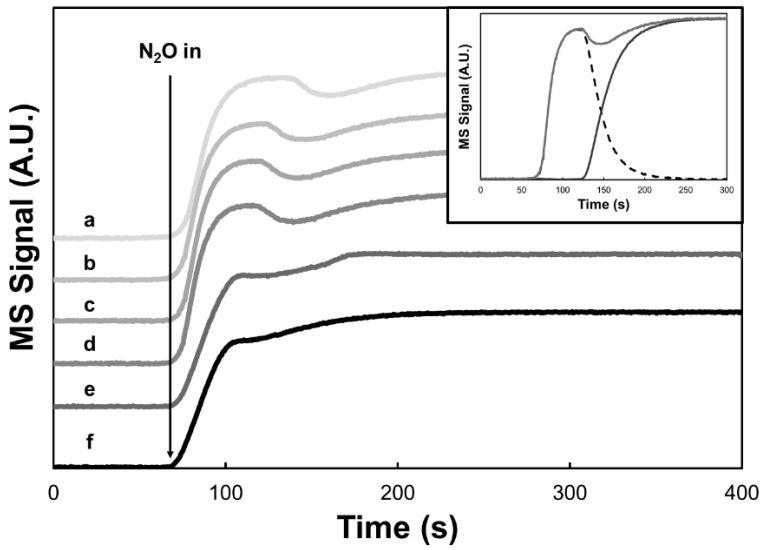

Figure S4. Nitrogen balance of the N_2O titration process on the 10 μm Cu particle from the MS signal summation of nitrogen contained gas species from N_2O titration processes on reduced metallic Cu powders at a) 40 °C, b) 0 °C, c) -10 °C, d) -20 °C, e) -30 °C and f) -40 °C, curves are offset. Inset: As an example, a) the summation curves at 0 °C (the same as curve b) in main panel)

is obtained by adding the MS signal of b) the net N_2 product and c) N_2O tail gas, both signals are corrected from fragmentation ratio.

In Fig. S4 a total nitrogen balance analysis for output gas is performed by adding the N_2 products and the N_2O output together-as in the inset panel.-The titrations performed at temperatures above -20 °C all yield similar total nitrogen output with consistent curve shape (curves a-d). At lower temperatures (curves e and f), an obvious intensity loss starting at ~ 50 s after N_2O induced, which is about the midpoint of the titration peak. This indicates that at higher temperatures, the reaction through surface retains the stoichiometry $N_2O \rightarrow N_2$ exchange which results in consistent nitrogen balance. At lower temperatures, the exchange stoichiometry no longer applies as the physisorbed N_2O are not involved. It is concluded that starting from around -30 °C, N_2O physisorption starts and titrations performed at temperatures lower than -30 °C are not considered suitable for this metallic powder copper sample surface area measurements.