Electronic Supplementary Information (ESI)

Nitrate formation and iron dissolution in the heterogeneous reactions of NH_3 on nano α-Fe_2O_3

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S1. Gases supply system

The gas supply system is shown in Figure S1. Mass flow controller was used to control high-purity N_2 and O_2 and simulate atmospheric conditions (79 vol.% N_2 + 21 vol.% O_2). By bubbling ultra-pure water and controlling the flow of N_2, the relative humidity (RH) in the reaction tank was adjusted to the required experimental conditions.

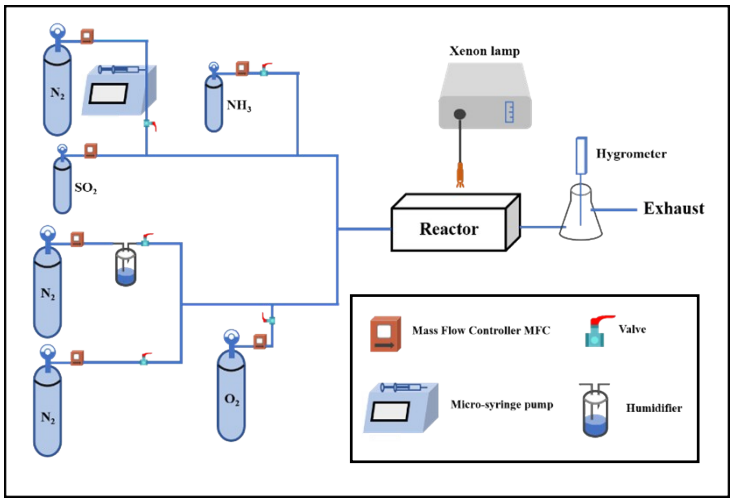

Figure S1. Air supply system.

The concentration of SO_2 and NH_3 was controlled by a mass flow controller. Liquid organic acids (formic acid, acetic acid and acrylic acid) were continuously injected into the gas pipeline through a single channel injection pump (Model: ISPLab01, DK Infusetek Co., LTD., China), and evaporate into gas at a certain flow rate of N_2 into the reaction chamber. During the experiment, a three-hole conical flask was added behind the reaction chamber to allow the reaction air to pass through. The hygrometer (Model:HM42PROBE, VAISALA, Finland) was inserted into the bottle through the upper hole and sealed with a soft rubber plug to measure humidity online. The gas lines in the experiment are made of Teflon tubes, controlled by mass flow controllers and valves. The gas entered the reaction chamber after mixing, and the total flow rate was

400 mL·min^{-1}. The infrared spectrum was then measured.

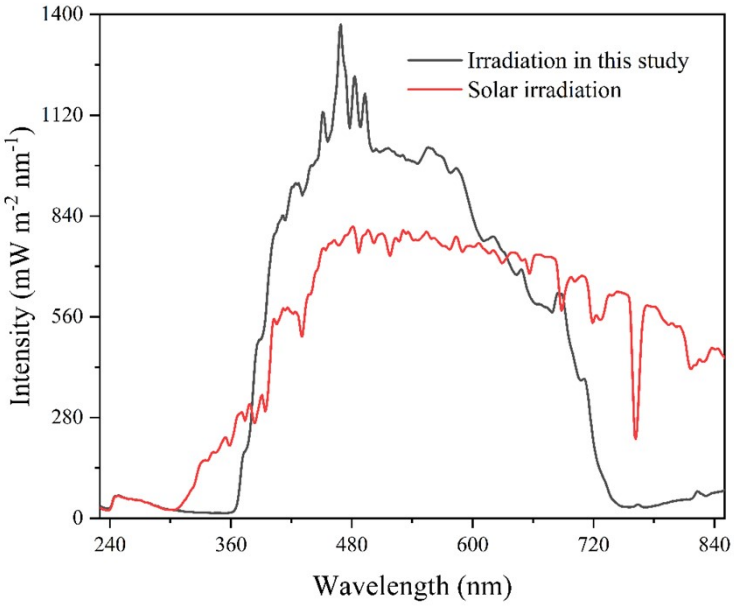

Figure S2. Comparison of xenon lamp and sunlight spectrum.

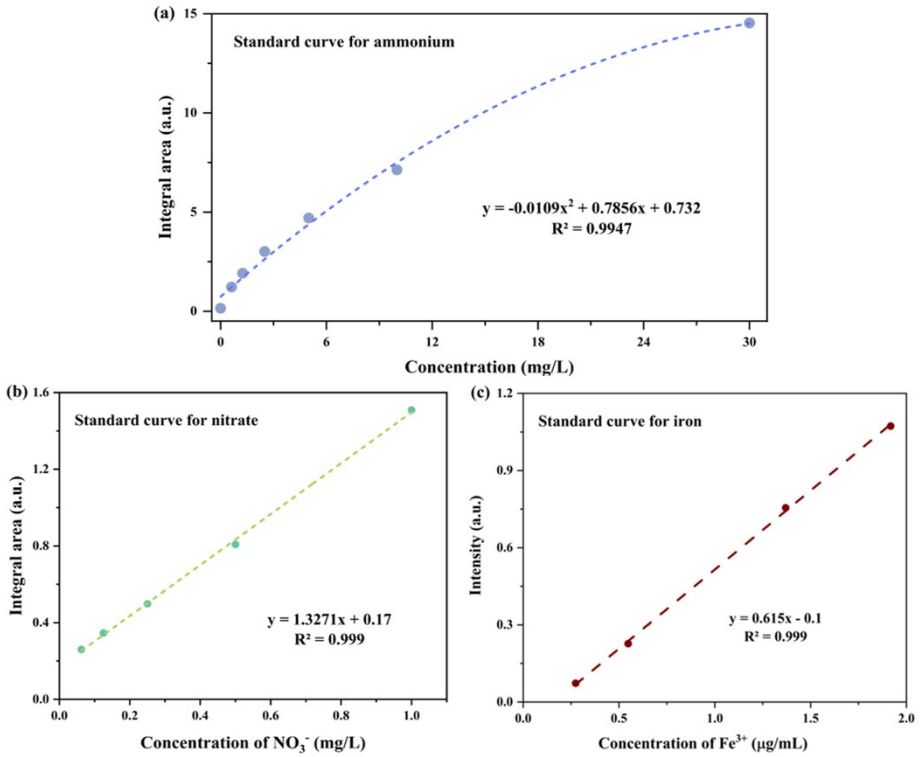

Figure S3. Standard curve of (a) NH_4^+ (b) NO_3^- (c) Fe^{2+}.

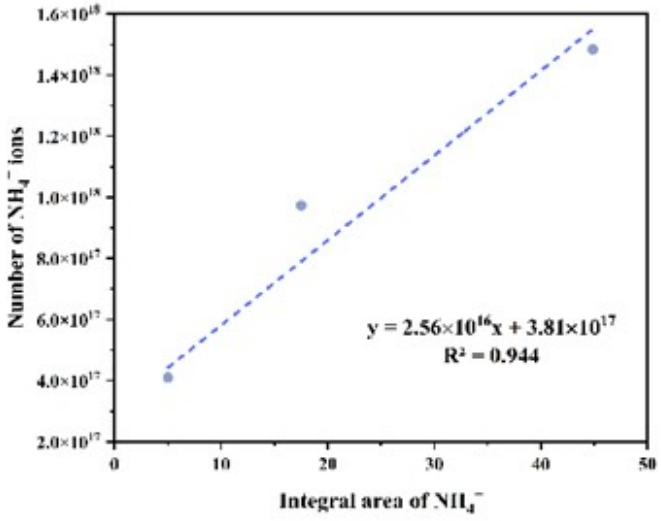

Figure S4. Standard curve of the integration area of ammonium ion number and its infrared characteristic peak.

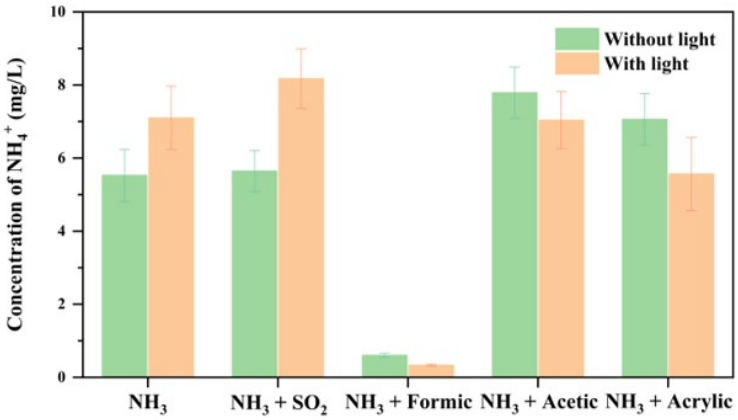

Figure S5. Concentrations of NH_4^+ on the surface of particulate matter after different reactions determined by IC. Note that the NH_4^+ detected by IC are the total amount of NH_4^+ and adsorbed NH_3 on the surface of α-Fe_2O_3 in the IR spectra.

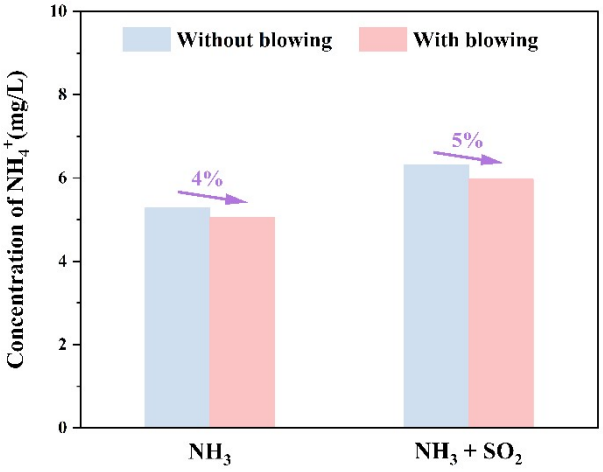

Figure S6. Concentration of NH_4^+ with or without blowing. Note that the NH_4^+ detected by IC are the total amount of NH_4^+ and adsorbed NH_3 on the surface of α-Fe_2O_3 in the IR spectra.

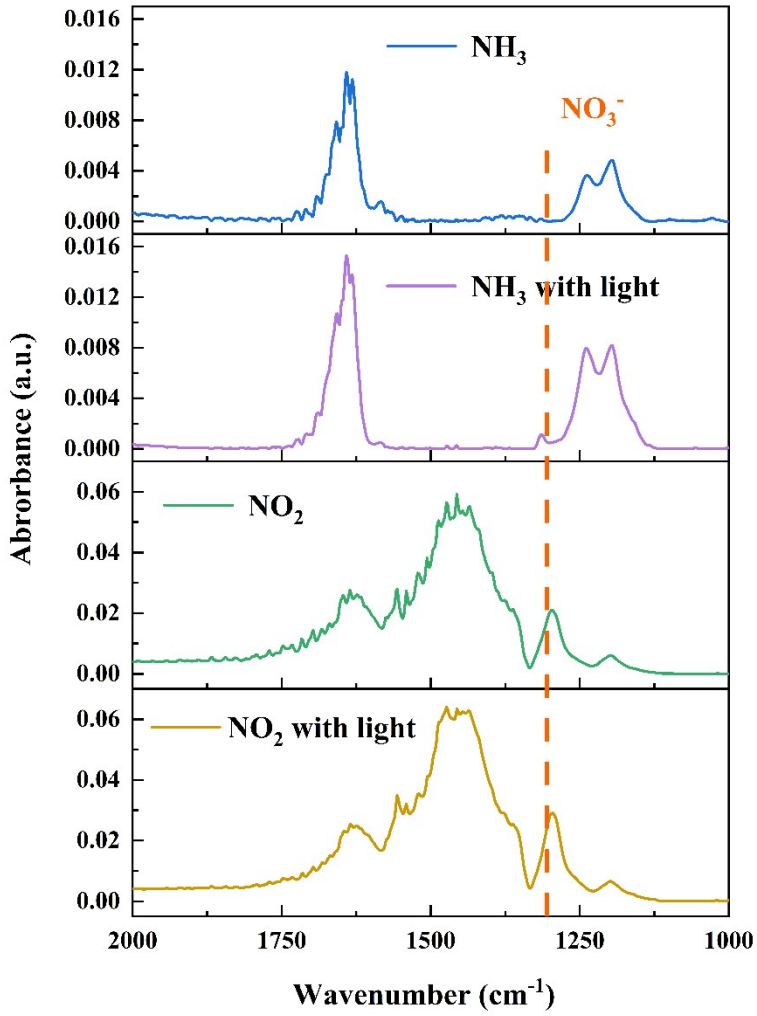

Figure S7. Comparison of infrared spectra of NO_2 and NH_3 on nano α-Fe_2O_3.