Absorption and oxidation of nitrogen oxide in ionic liquids

A new strategy for capturing nitrogen oxide, NO, from the gas phase is presented. Dilute NO gas is removed from the gas phase by ionic liquids under ambient conditions. The nitrate anion of the ionic liquid catalyzes the oxidation of NO to nitric acid by atmospheric oxygen in the presence of water. The nitric acid is absorbed in the ionic liquid up to approximately one mole HNO₃ per mole of the ionic liquid due to the formation of hydrogen bonds. The nitric acid can be desorbed by heating, thereby regenerating the ionic liquid with excellent reproducibility. Here, time-resolved in-situ spectroscopic investigations of the reaction and products are presented. The procedure reveals a new vision for removing the pollutant NO by absorption into a non-volatile liquid and converting it into a useful bulk chemical, that is, HNO₃.

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