

OGURA LAB.

Frontiers for the Microporous World



Research Center for Sustainable Materials Energy Integration
Department of Materials and Environmental Science

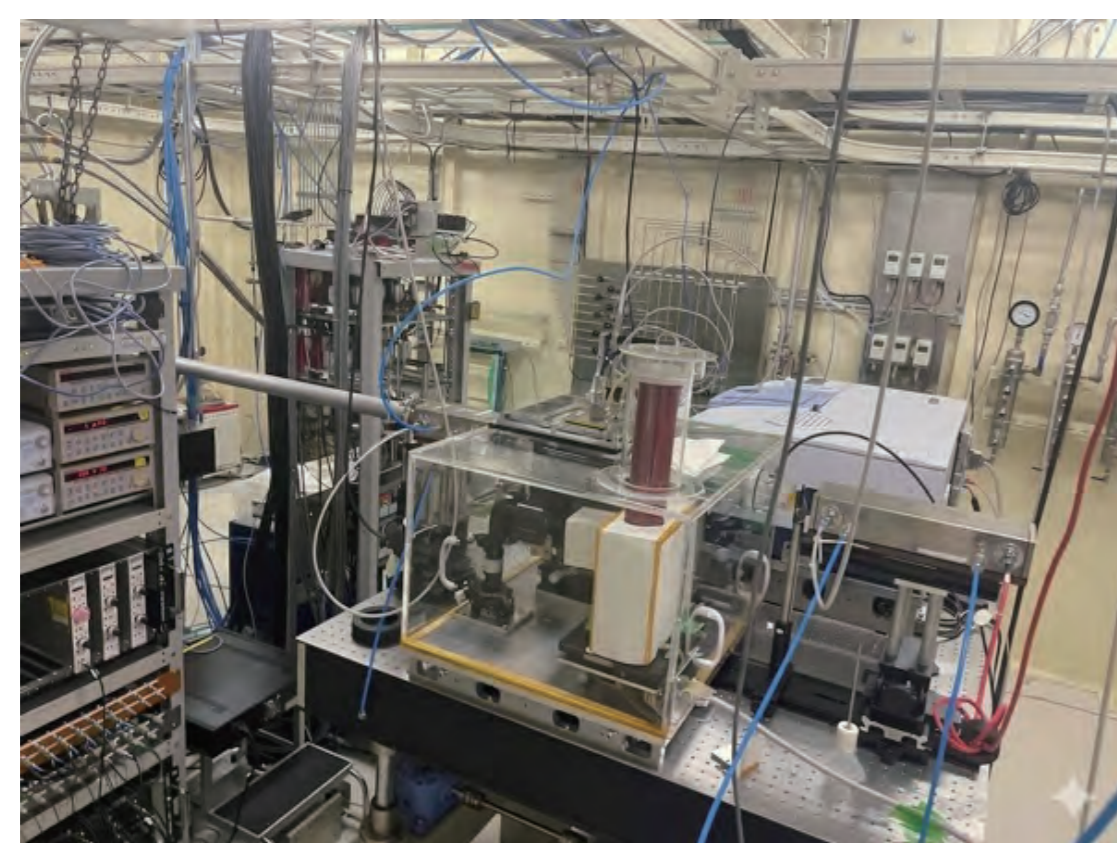
Catalyst/Catalysis, Zeolite Science

Department of Chemical System Engineering, Graduate School of Engineering

<https://www.ogulab.iis.u-tokyo.ac.jp/>

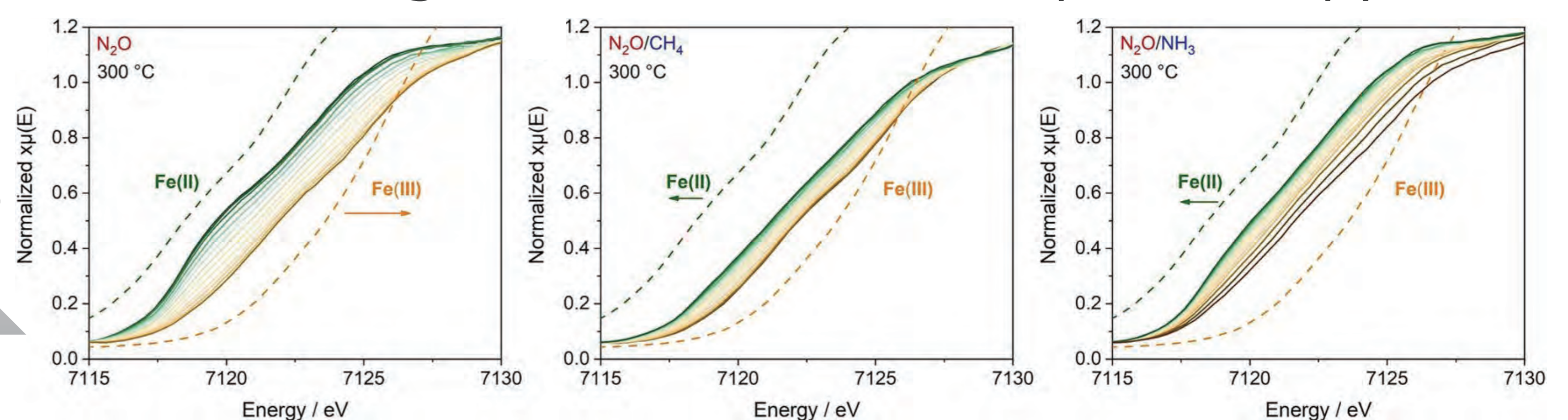
Elucidation of Zeolite Catalysis Using in situ Spectroscopy

Zeolite catalysts are widely used in petroleum refining and automotive exhaust purification, making them essential materials that support modern society. Zeolites are porous materials with numerous cavities that function as catalysts when metal cations are introduced into their pores. For example, Fe-exchanged beta zeolite containing iron ions (Fe^{2+}) can simultaneously remove harmful gases such as NO , N_2O , NH_3 , and CH_4 . In our laboratory, we use the synchrotron "SPRING-8" to perform measurements while the catalyst is actively operating. We aim to elucidate catalytic reaction mechanisms using in situ XAS-DRIFTS spectroscopy.

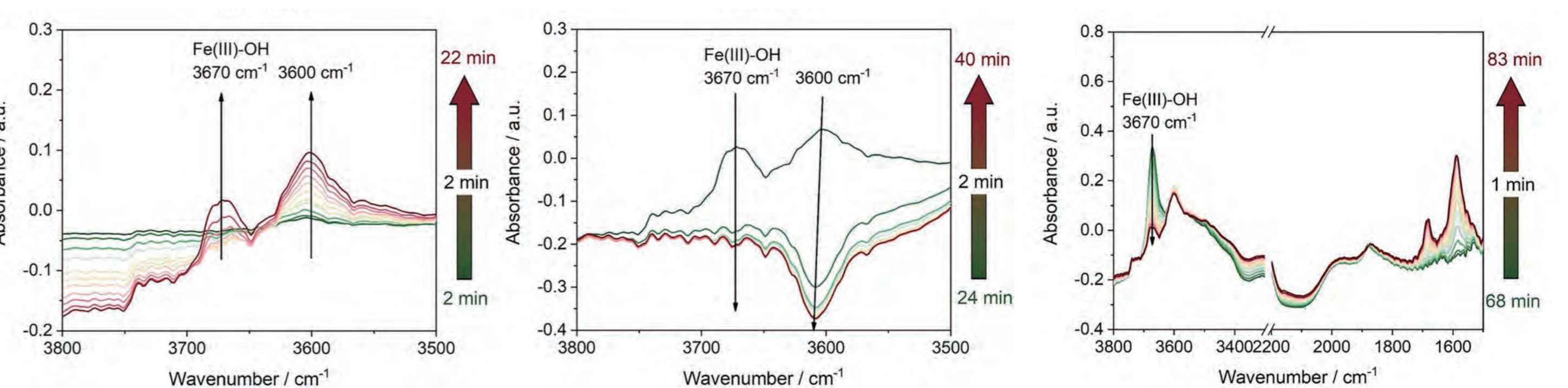


SPRING-8 Setup

XAS
Same Time
DRIFT

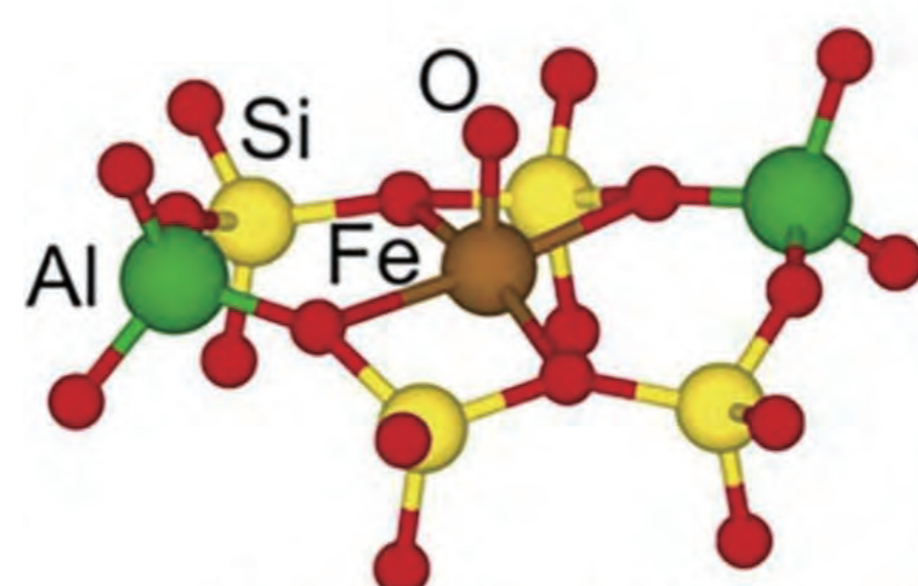


Observation of changes in the electronic state of iron ions during the reaction



Observation of changes in surface-adsorbed species on iron ions during the reaction

Elucidating the reaction mechanism over $[\text{FeO}]^{2+}$ species as the active site



FeO species in beta zeolite

