Development of Recovery and Removal Techniques of Dilute Reactive Nitrogen to Realize Nitrogen Circulating Society

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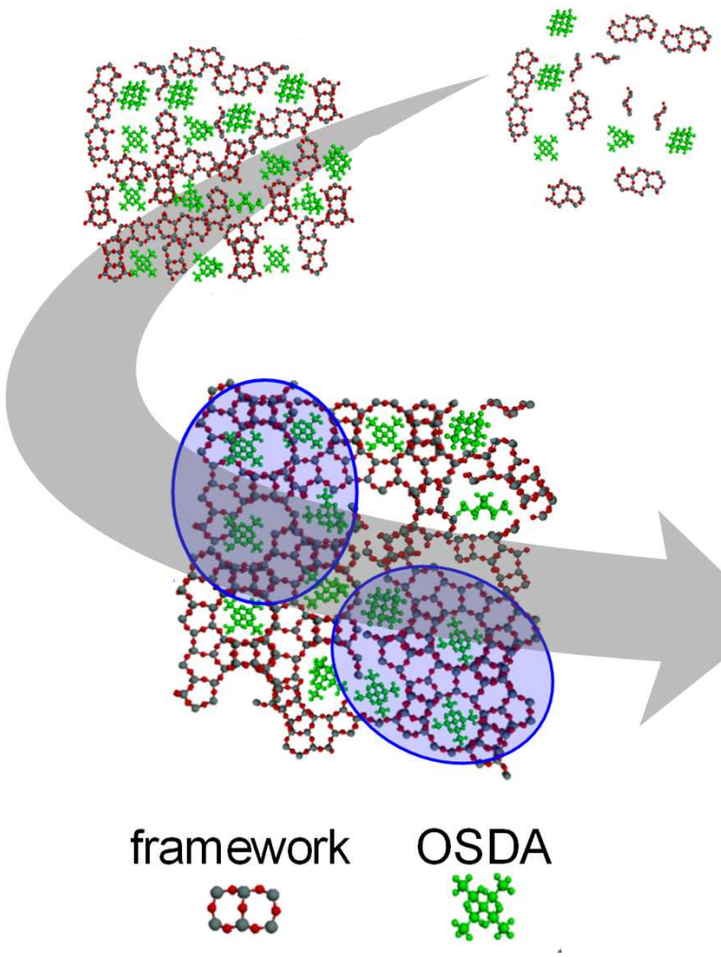
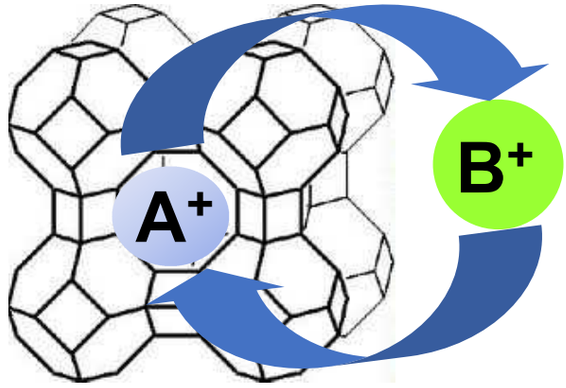
Environmental Purification by Zeolites

Zeolite Synthesis



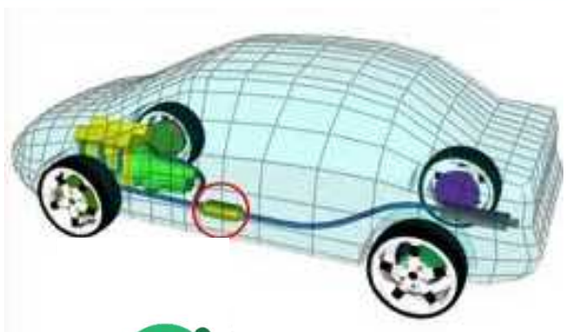
- Ultrafast Synthesis of Zeolites
- Control of Al distribution

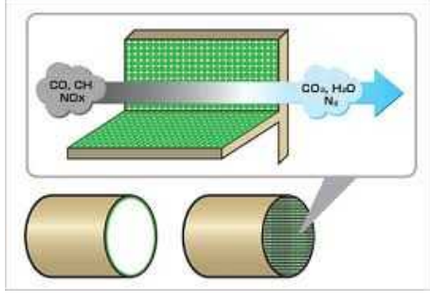
Adsorbents



- NH_3 capture in aqueous solution

Fuel Gas Treatment for Automobiles





- NOx decomposition and low N_2O evolution

【Final Goal】

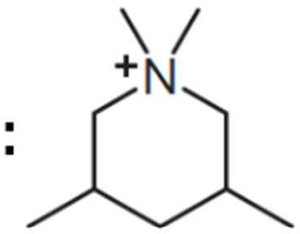
- NH_3 capture from real sewage in pilot plan scale
- NOx decomposition over zeolites in pilot scale
- Direct NO decomposition (NH_3-free system)

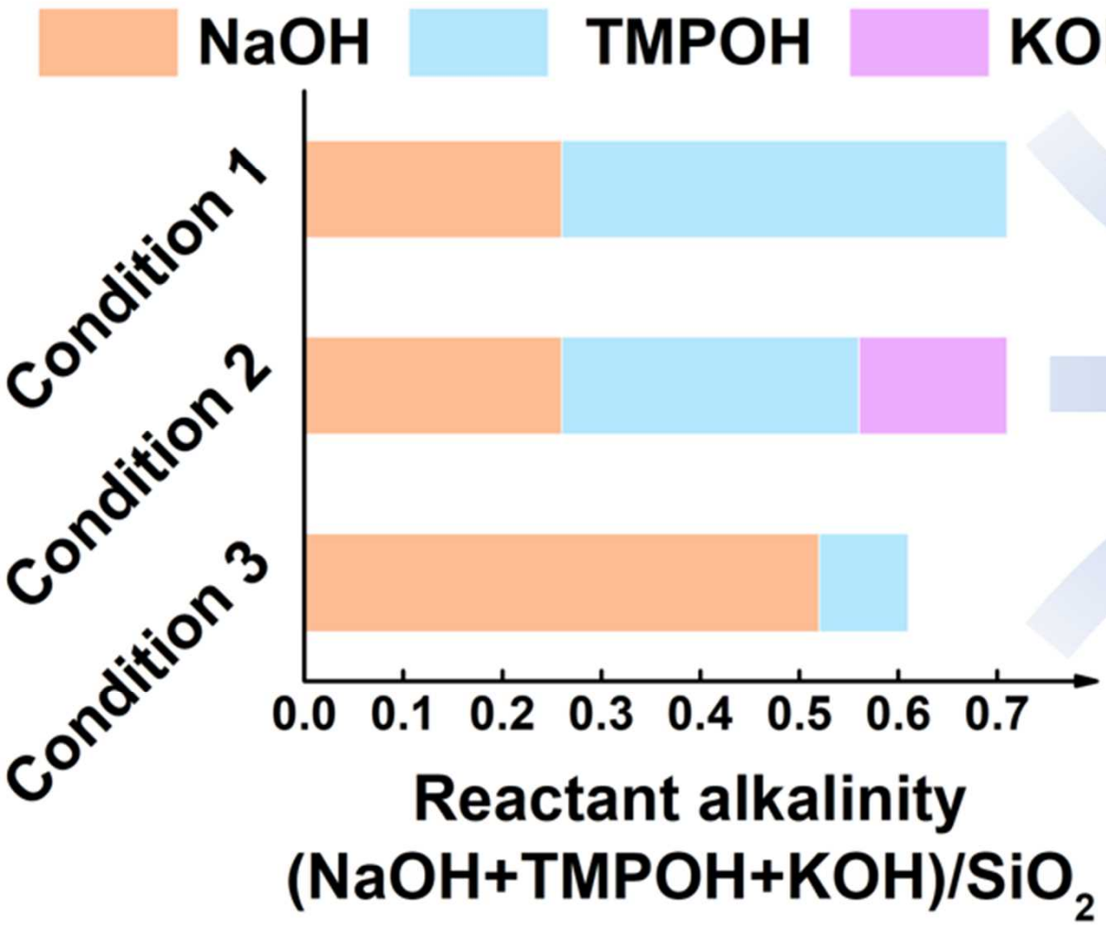
Ultrafast Synthesis of Zeolites

Colloidal Silica + **Sodium Aluminate** + **Seed**

Autoclave

TMP⁺:



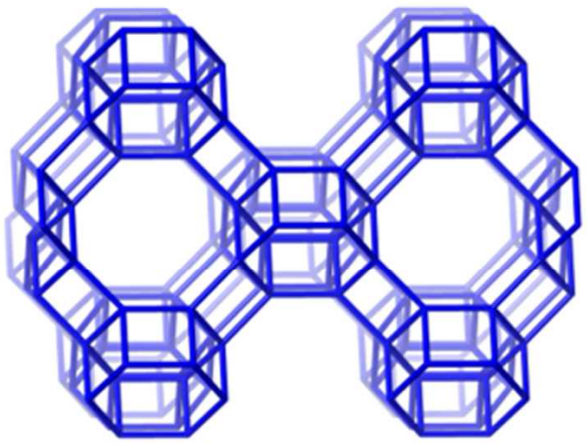


Within 4 h

Hydrothermal Synthesis @ 210℃

Within 80 min

Tubular reactor



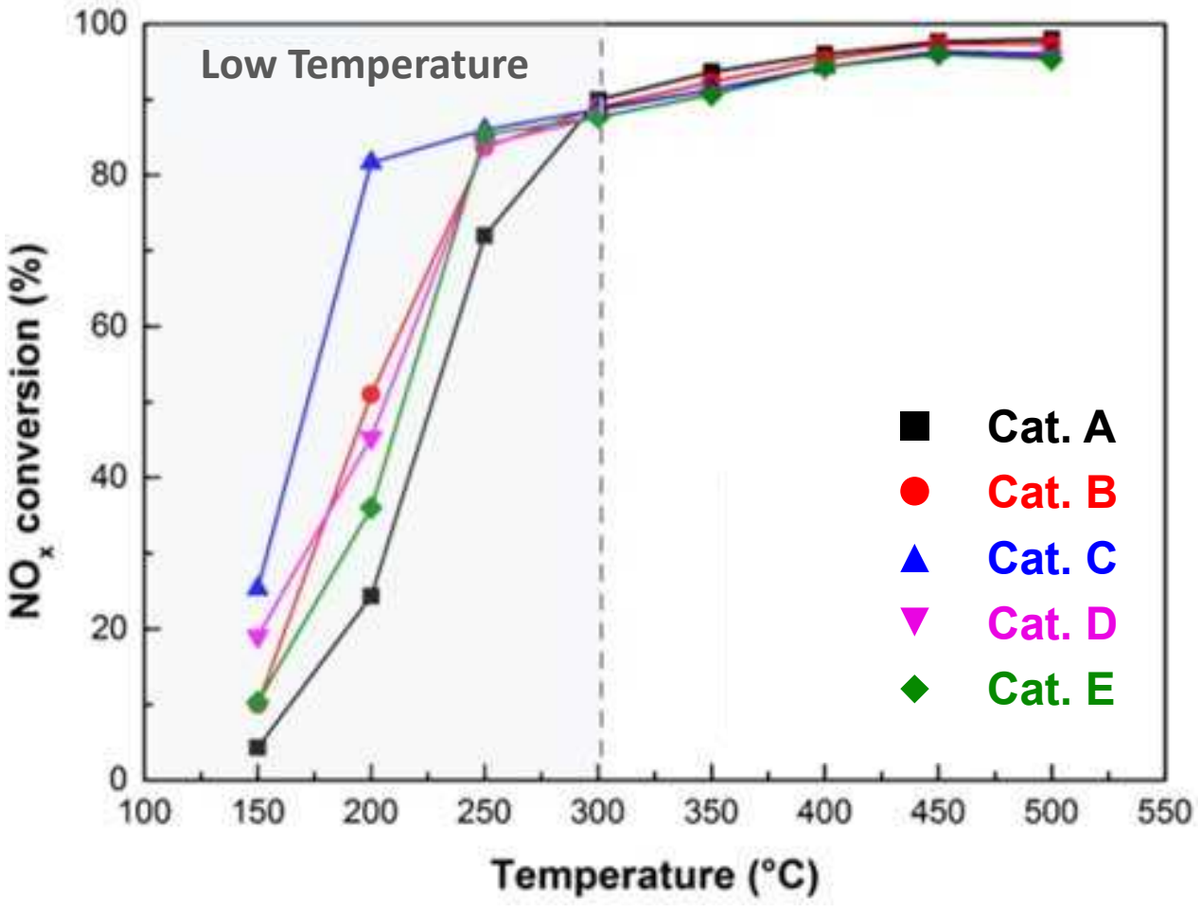
SSZ-39 zeolite

Synthesis time reduced to less than one hundredth

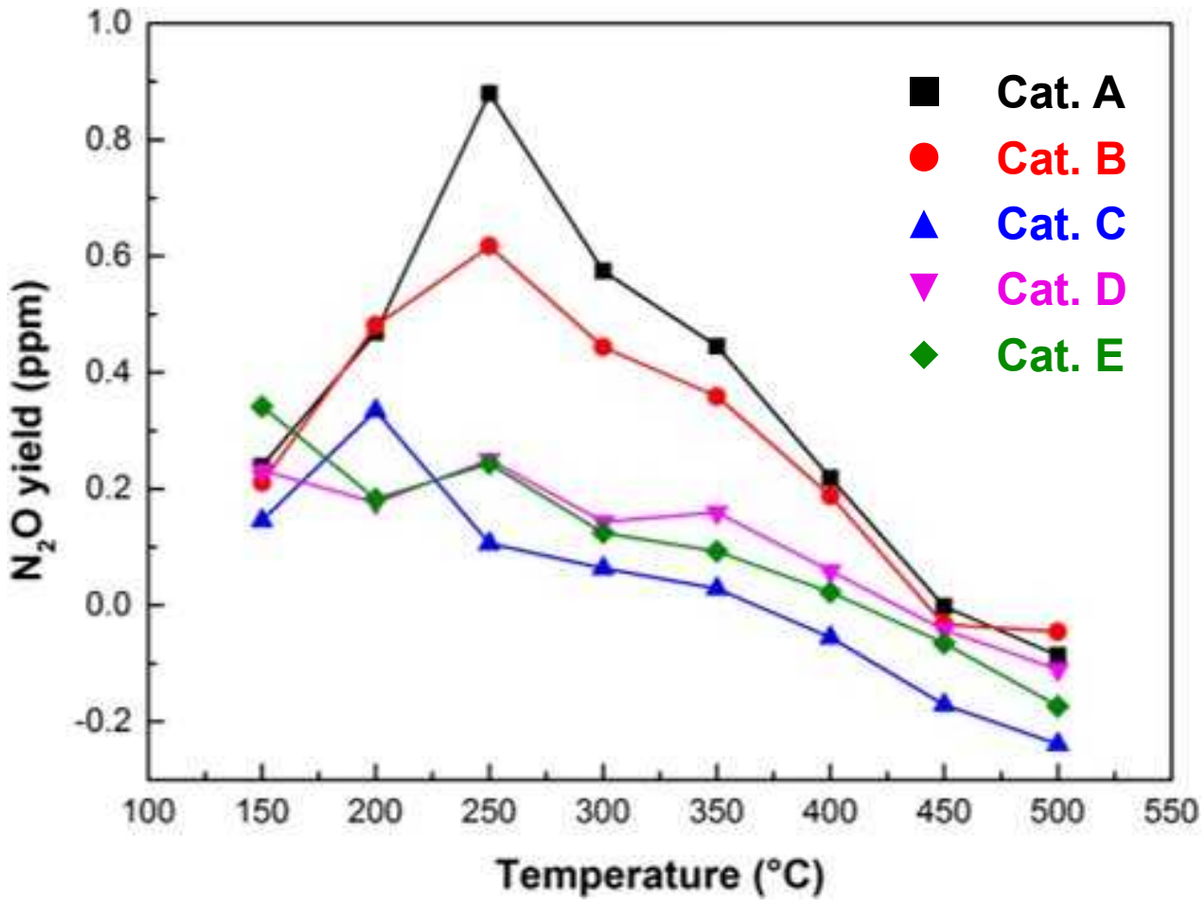
Reduced use of expensive raw materials

NH_3-SCR over Zeolite Catalysts

◆ NO conversion rate

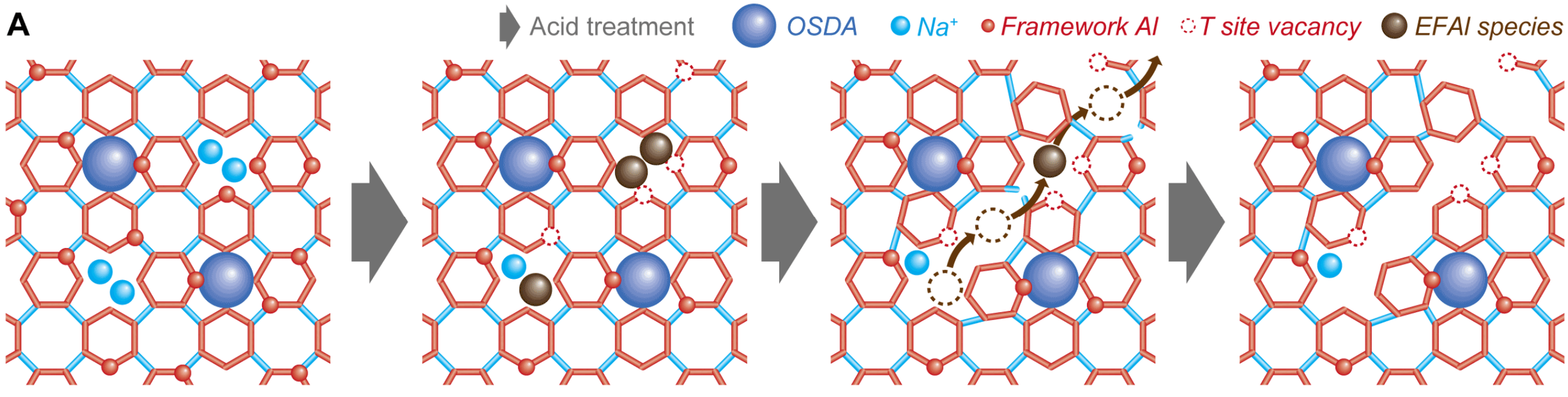


◆ N_2O evolution



Cat. C: **High NO conversion at low temperature range (> 80%, 200℃)**
Low N_2O evolution

Control of Al distribution in Zeolite Frameworks

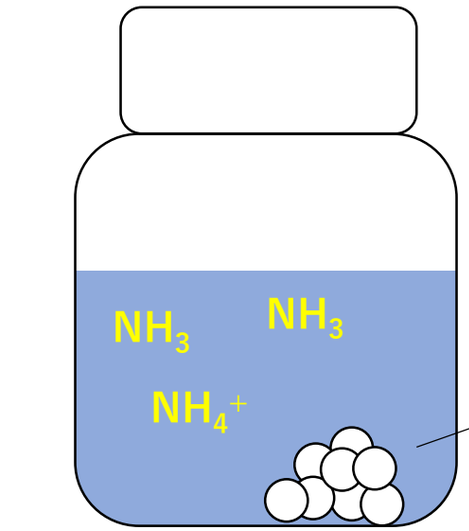


Compositional control of small pore zeolites by post-treatment has not been achieved so far.

→Control by newly discovered mechanism
→Substantial improvement in stability

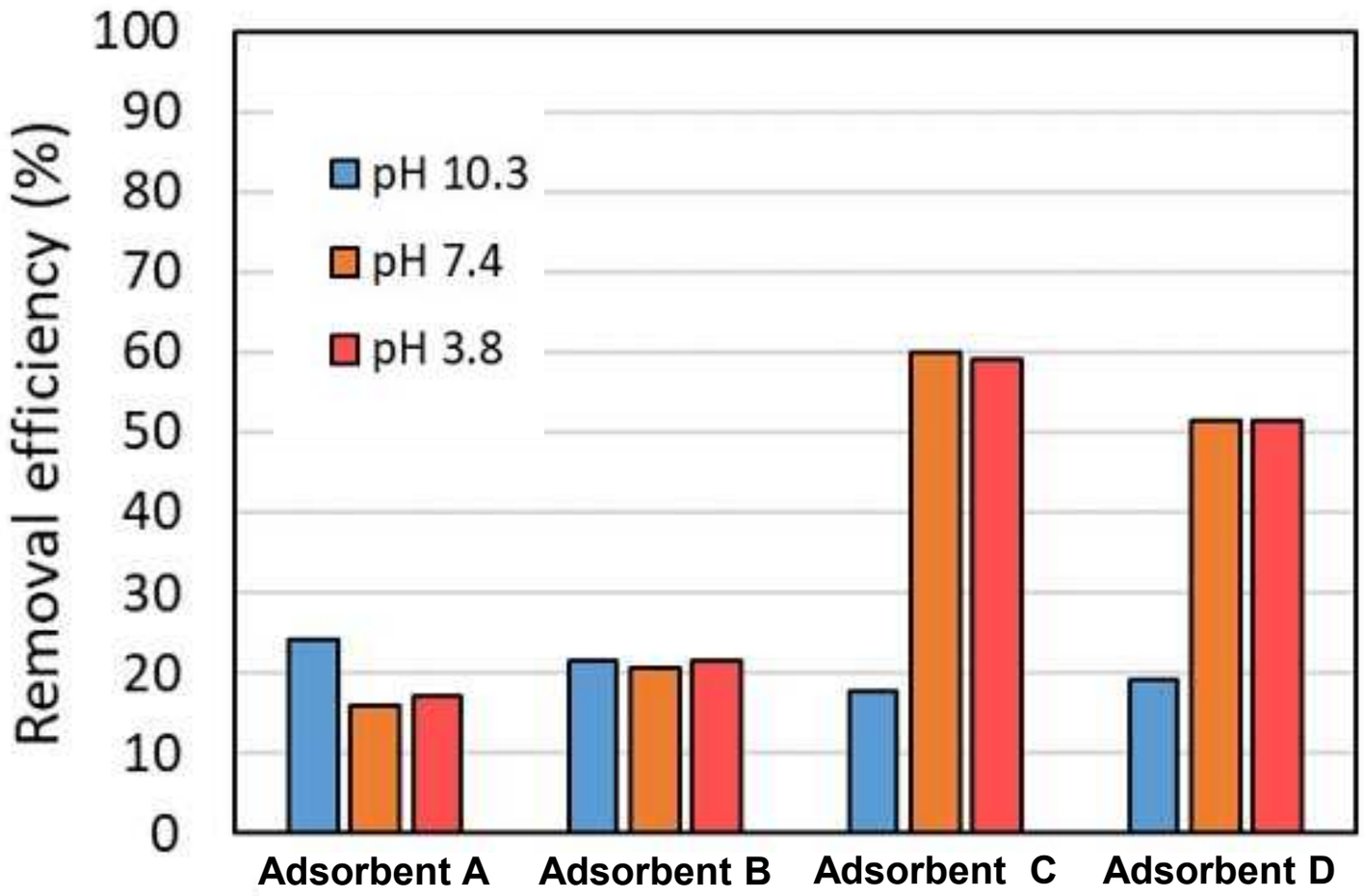
NH_3 Capture from Real Sewage

- **Experiment for NH_3 capture**



Adsorbent

NH_3/NH_4^+ solution (real sewage)



High removal efficiency of NH_3 in real sewage

→ in future work, try in pilot plant scale

Recycle

- **Soil enrichment**
- **Fuel**
- **NH_3 solution**

MOONSHOT
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