



Title	A rapid synthesis of Hf-Beta zeolite as highly active catalyst for Meerwein-Ponndorf-Verley reduction by controlling water content of precursor gel
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# ***Supporting Information***

## **A Rapid Synthesis of Hf-Beta Zeolite as Highly Active Catalyst for Meerwein-Ponndorf-Verley Reduction by Controlling Water Content of Precursor Gel**

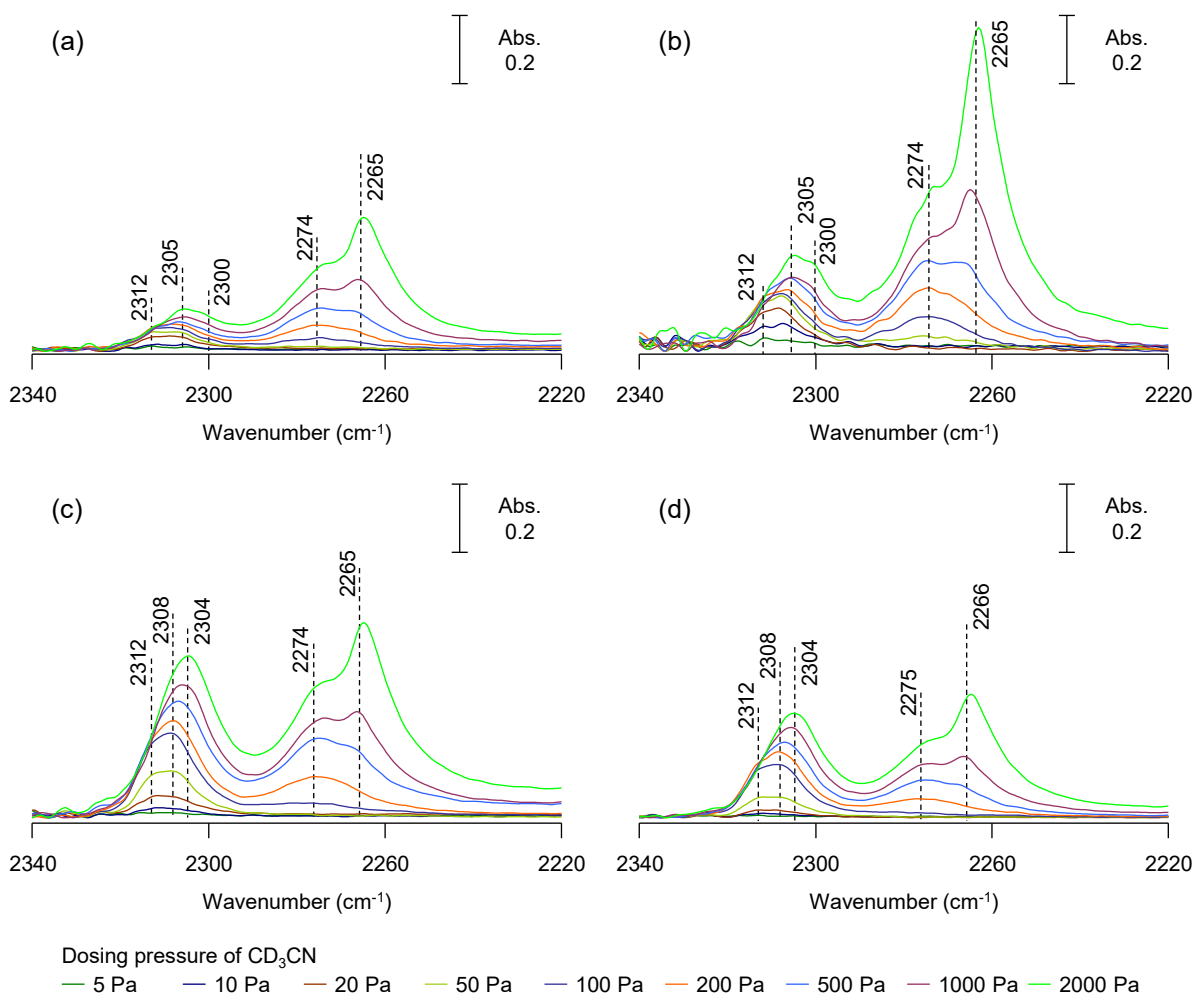
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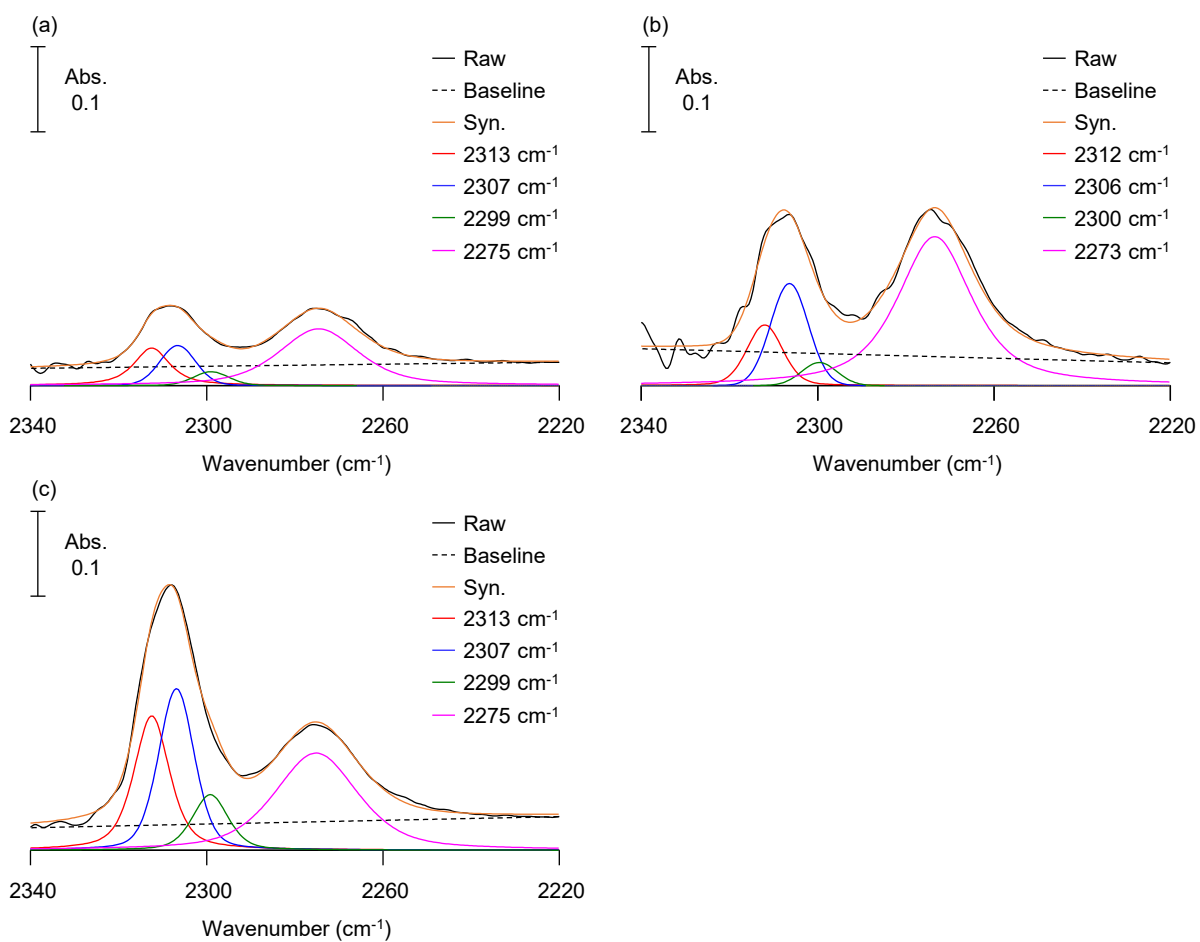
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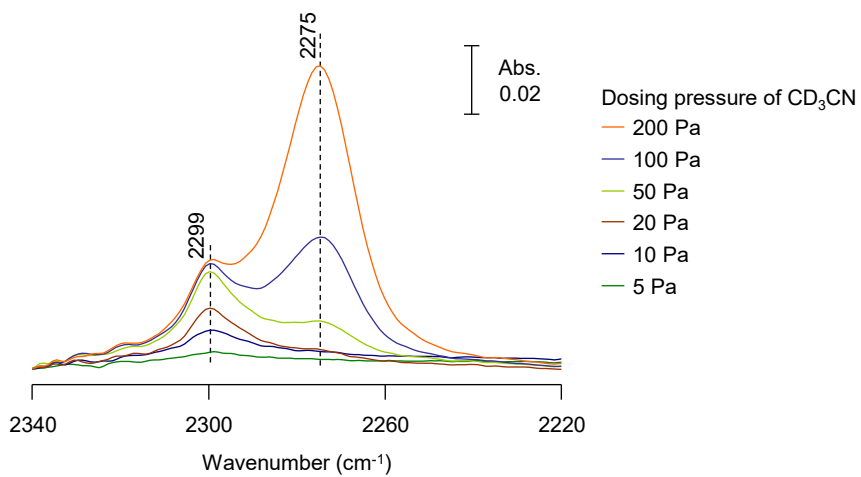
Tel: +81-11-706-2259, E-mail: otomo@ees.hokudai.ac.jp



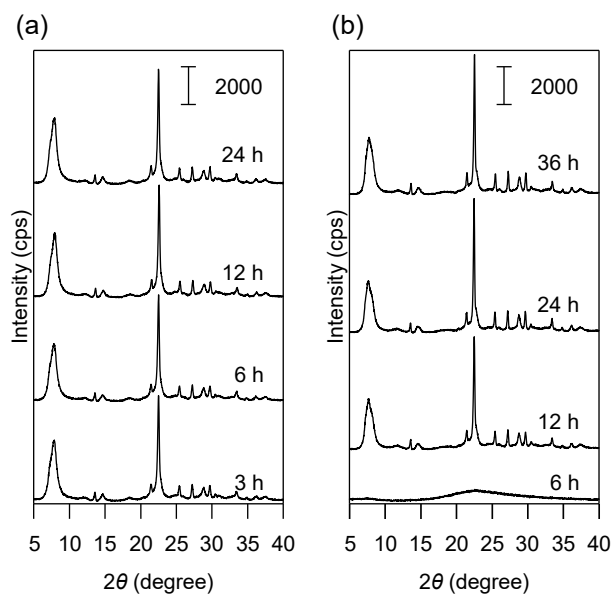
**Figure S1.** FT-IR spectra of CD<sub>3</sub>CN adsorbed on Hf-Beta (a) Hf-1.4-72, (b) Hf-4.5-72, (c) Hf-6.4-72, and (d) Hf-HF. Dosing pressure of CD<sub>3</sub>CN = 5 – 2000 Pa.



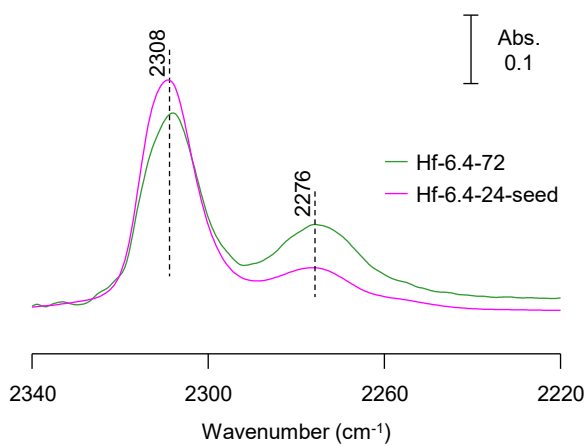
**Figure S2.** Deconvoluted FT-IR spectra of CD<sub>3</sub>CN adsorbed on (a) Hf-1.4-72, (b) Hf-4.5-72, and (c) Hf-6.4-72. Dosing pressure of CD<sub>3</sub>CN was 200 Pa.



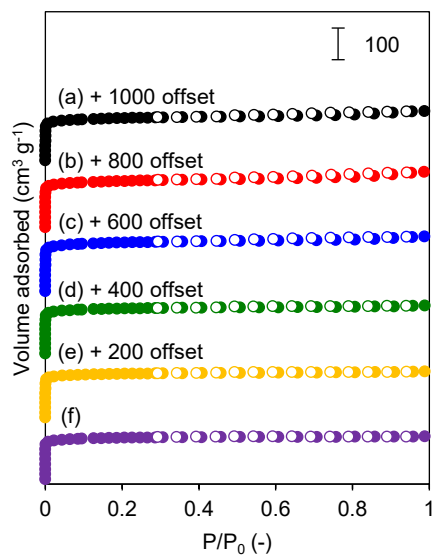
**Figure S3.** FT-IR spectra of CD<sub>3</sub>CN adsorbed on HfO<sub>2</sub>/Si-Beta. Dosing pressure of CD<sub>3</sub>CN = 5 – 200 Pa.



**Figure S4.** XRD patterns of calcined samples synthesized from precursor gel containing seed crystal with H<sub>2</sub>O/SiO<sub>2</sub> = (a) 1.4 and (b) 6.4 at different crystallization periods.

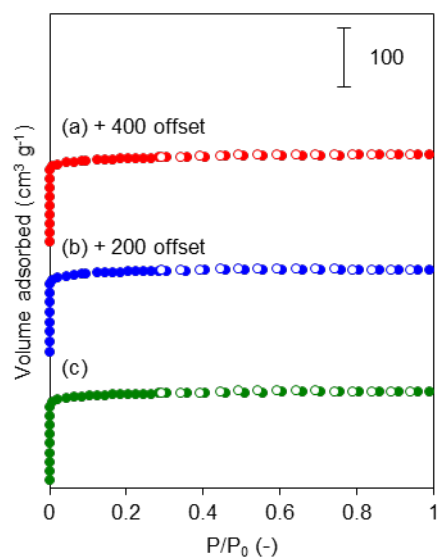


**Figure S5.** FT-IR spectra of CD<sub>3</sub>CN adsorbed on Hf-6.4-72 and Hf-6.4-24-seed. Dosing pressure of CD<sub>3</sub>CN was 200 Pa.

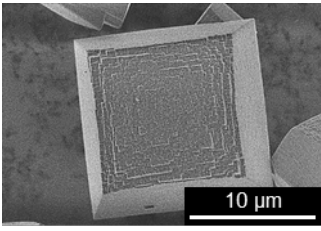


**Figure S6.** N<sub>2</sub> adsorption-desorption isotherms at -196 °C for (a) Hf-1.4-72, (b) Hf-2.2-72, (c) Hf-3.3-72, (d) Hf-4.5-72, (e) Hf-5.5-72 and (f) Hf-6.4-72.





**Figure S7.** N<sub>2</sub> adsorption-desorption isotherms at -196 °C for (a) Hf-HF, (b) Zr-HF and (c) Sn-HF.



**Figure S8.** SEM image of Hf-HF.