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FORMALDEHYDE ADSORPTION MECHANISM OF DIETHYLENETRIAMINE INTERCALATED α -ZIRCONIUM PHOSPHATE

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In the course of our study on the synthesis of new type of gas adsorbent based on layered phosphate, diethylenetriamine (2E3A) intercalated α -Zr(HPO₄)₂ · H₂O (α -ZrP) can adsorb considerable amount of carboxylic acid.¹ In this work, the adsorption mechanism of formaldehyde gas in 2E3A intercalated α -ZrP was examined by XRD, and solid-state NMR using formaldehyde (¹³C, 99%) aqueous solution (70%) as a source of formaldehyde vapor.

In addition to large signal due to formaldehyde at 70 ppm, other extra signals appear around 40 and 165 ppm. Formaldehyde is known to occur self oxidation-reduction, called Cannizzaro reaction, catalyzed by strong base in aqueous solution as follows,

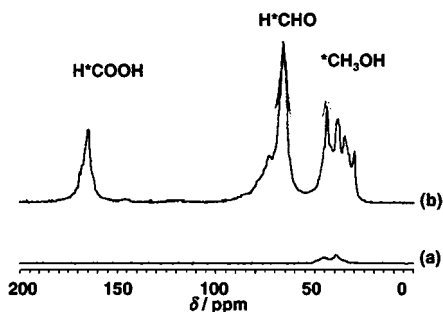


FIGURE 1 ¹³C CP/MAS NMR spectra (a) before and (b) after formaldehyde adsorption.

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Therefore, the adsorption accompanies self oxidation-reaction catalyzed by the amino groups of 2E3A in the interlayer region of α -ZrP. This mechanism is consistent with almost no change of XRD and ^{31}P solid-state NMR after the adsorption of formaldehyde.

REFERENCE

- [1] H. Nakayama, A. Hayashi, T. Eguchi, N. Nakamura, and M. Tsuchiko, *Mol. Cryst. Liq. Cryst.*, **341**, 573 (2000).