Topics

Formaldehyde-adsorbent Sheet

Kazuhiro Fukumoto, Organic Materials Lab.

"Sick house syndrome" is becoming a problem. A number of people, who live in new or just renovated houses, have suffered from headaches, eye, nose, and throat irritation, dry or itchy skin, dizziness, and nausea. "Sick house syndrome" refers to a symptom, which appears when gaseous formaldehyde, emitted from some adhesives used in furniture, wallpaper and construction materials, leaks out into the air and affects human health.

Recently, we have developed a formaldehyde-adsorbent sheet (**Fig. 1**), which reduces the formaldehyde concentration in the air. Thus, it maintains a comfortable living environment. This sheet is made of a mixture of pulp, sepiolite (clay mineral) and amino acids. An amino acid is not reactive with formaldehyde by itself. Adsorbents such as sepiolite, activated carbon and silica gel also have a very small formaldehyde-adsorbing capacity. In this study, we found that the reactivity of the amino acid toward formaldehyde was significantly enhanced by combining with sepiolite[1]. **Figure 2** shows the adsorption isotherms of formaldehyde on the adsorbents at 25°C. For example, the adsorptivity of sepiolite combined with 5% amino acid was about 10 times greater than that of only sepiolite at a low equilibrium concentration (<1ppm).

Figure 3 shows a structural model of sepiolite combined with an amino acid and its reaction mechanism toward formaldehyde. The activation of the amino acid is caused by exchanging the water molecules coordinated to the magnesium ions at the edges of the structure with the carboxylic end of the amino acid. As a result, that activated amino acid on sepiolite reacts with formaldehyde to form an imine compound.

We conducted field-tests using real furniture and living quarters. Particularly, in the storage space such as inside the packages of sectional furniture, the developed sheet could effectively reduce the formaldehyde concentration (initial: 350ppb, final: 50ppb). We also confirmed that the formaldehyde adsorbed by the developed sheet was not released by the normal change in temperature and humidity in the living environment. Consequently, the developed sheet containing amino acids and sepiolite is very useful as a formaldehyde remover under actual environmental conditions.

The formaldehyde-adsorbent sheet was jointly developed by Aisin Seiki Co., Ltd., Japan, and Omi Mining Co., Ltd., Japan. It was adopted for use in formaldehyde removers placed into the packages of sectional furniture in September 2001. We plan to develop a wide range of products using this new formaldehyde-adsorbent sheet, including wallpaper and curtains for new houses and buildings.

Reference

1) Fukumoto, K., Suzuki, T. : Proc. I for 81st Meet. of Chem. Soc. of Jpn., (2002), 359

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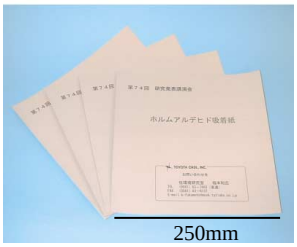

Fig. 1 Formaldehyde-adsorbent sheets.

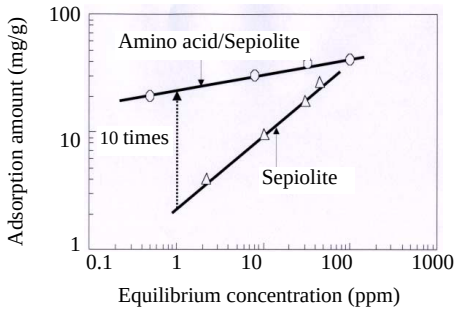

Fig. 2 Adsorption isotherms of formaldehyde on the adsorbents at 25°C.

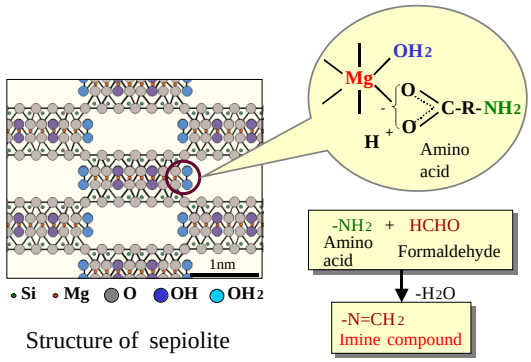

Fig. 3 A structural model of sepiolite combined with an amino acid and its reaction mechanism toward formaldehyde.