

## Development of the Novel Technique with the Aqueous Solution for Preparing Hydrophobic Monolayers

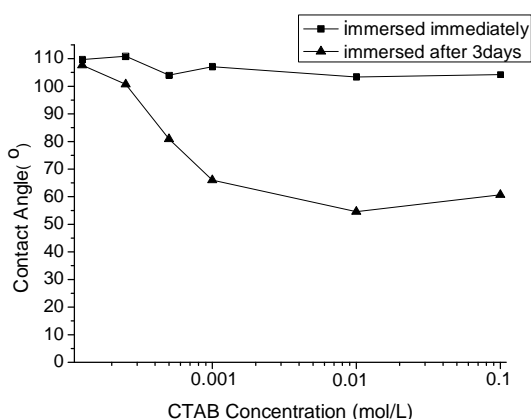
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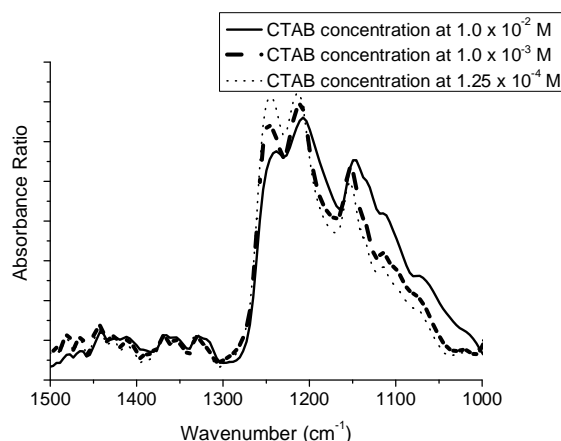
**Abstract** – The novel technique with the aqueous solution containing fluoroalkyl group has been developed for preparing the hydrophobic monolayers. First, heptadecafluoro-1,1,2,2-hydrodecyltrimethoxysilane (HDFS) was dispersed into ethanol (solution A), and cetyltrimethylammonium bromide (CTAB) was dissolved into deionized water (solution B). Second, the chemical adsorption (CA) solution was prepared by mixing solution A and the solution B. The HDFS-CA-monolayer was prepared on the substrate by immersing into the CA solution. Water contact angles of the HDFS-CA-monolayer was approximately 105°. This value was similar to that of the conventional method with an organic organic adsorption solutions.

The Chemically Adsorbed Monolayer (CAM) was able to prepare on the substrate surface by immersing into the Chemical Adsorption (CA) solution. Generally, the solvent of the CA solution was used an organic solvent. However, it leads to the environment pollution and high-cost processing. In this study, we will report the novel technique with the aqueous solution for preparing the hydrophobic CAM was developed. Heptadecafluoro-1, 1, 2, 2-hydrodecyltrimethoxysilane (HDFS) was dissolved into ethanol (solution A), and cetyltrimethylammonium bromide (CTAB) was dispersed into deionized water (solution B). And then, the CA solution was prepared by mixing the solution A and the solution B. HDFS-CAMs were prepared by immersing the substrate into the CA solution, and the samples were characterized by water contact angles and Fourier Transform Infra Red spectroscopy (FTIR).

The pot life of the CA solutions at 10min and 3days after the mixing were evaluated by the measuring water contact angles of HDFS-CAMs on the substrate. The water contact angles were plotted as a function of the CTAB concentration was shown in Fig. 1. Regardless the CTAB concentrations, the contact angles on HDFS-CAMs prepared by the fresh-CA solution were approximately 105°. In contrast, the water contact angles on HDFS-CAMs prepared by the CA solution after 3 days were similar to that on the conventional methods when the CTAB concentration was low (at  $1.25 \times 10^{-4}$  M). In addition, the FTIR spectra of HDFS prepared by the conventional method and the novel method at different concentration were shown in Figure. 2. Absorption band peaks at 1150, 1220 and 1260  $\text{cm}^{-1}$  show the existence of fluoro alkyl groups. As a result, HDFS-CAMs could be prepared with the aqueous solution containing the low concentration CTAB (at least  $1.25 \times 10^{-4}$  M) and the chemically adsorption monomers.



**Figure 1:** The water contact angles changes of monolayers prepared the 10min and 3days solutions after the mixing as a function of the CTAB concentrations.



**Figure 2:** The FTIR spectra of HDFS-CAMs prepared by the conventional and novel technique at different concentrations of CTAB.

### References

- [1] A. Marcia, A. Workman, S. Raghavan, P. Deymier, D. J. Monk, and R. Roop, Colloids and Surfaces A: Physicochem 232 (2004)