

## Manufacture of Metal-Completed Carbon Membrane and Application to Removal of Gases

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**Abstract:** Pollution of air by materials such as fine dust, volatile organic compound (VOC), and hydrofluoric acid has become serious. Among them, VOC is of particular concern, which is emitted from automobiles and consumption of oil or organic solvents. As a member of VOC, aromatic compounds (e.g., benzene) are carcinogens causing serious problems to human's immune system, and must be removed before they are discharged. VOC could be removed using a catalyst including a photo catalyst such as transition metal oxide (e.g.,  $\text{TiO}_2$ ), or a composite catalyst of a mixture of  $\text{TiO}_2$  and activated carbon. It has been reported, however, that VOC removal with catalytic treatment may yield some by-products that could become secondary sources of pollution. Thus air filter of adsorption type is drawing interest.

In this study, silica nanoparticles were synthesized, and then were pressurized into a disk and calcinated to obtain porous carbon membrane. The membrane was then chemically treated with -COOH functional group, and finally Ag was completed on the surface of the membrane. Effects of various silica synthesis parameters were systematically investigated on the size and the size distribution of silica nanoparticles.

The Ag-completed carbon membrane showed gas-removal capacity of  $5.90 \times 10^{-3}$  mg butane/g which is about four times higher than that of  $\text{TiO}_2$  catalyst ( $1.55 \times 10^{-3}$  mg butane/g). Results suggest the metal-completed carbon membrane developed in this study has some merits for application to removal of gases including VOCs. As it is based on adsorption, the process is harmless. Also anti-microbial and fine dust removal function was added.

**Keywords:** Carbon membrane, Volatile organic compound (VOC), Removal gases