Effect of sodium bicarbonate solution on methyltrimethoxysilane-derived silica aerogels dried under ambient pressure

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Silica aerogels (SAs) are promising nano-porous materials with high specific surface areas, porosities, and low densities [1]. Conventional synthesis of SAs involves a drying process to remove pore solvent, which usually is supercritical drying method. However, supercritical drying method requires expensive equipment and high-pressure operational condition. Ambient pressure drying (APD) method as an economical alternative but relies on tedious solvent exchange with low surface tension solvent. It was recently suggested a cheap combination of sodium bicarbonate and trimethylchlorosilane using in APD method of preparing SAs could preserve porous structure of wet gels during drying process [2].

Here we present a process of using APD method to prepare super-hydrophobic SAs from methyltrimethoxysilane (MTMS) [3]. SAs have a specific surface area and density of 423 $m^2 \cdot g^{-1}$ and 0.053 $g \cdot cm^{-3}$, respectively. The average pore diameter of SAs is 23 nm as the pore specific volume is 1.11 $cm^3 \cdot g^{-1}$. Further, the contact angle between water droplet and the surface of SAs under ambient condition can be as high as 166°, indicating SAs have a super-hydrophobic surface.

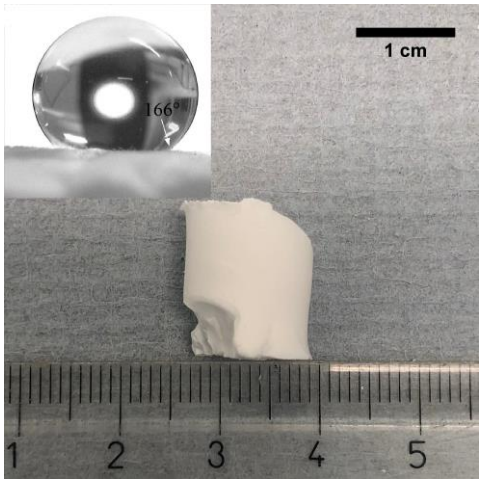

Figure 1: MTMS-derived silica aerogels via APD method using sodium bicarbonate and TMCS in solvent exchange step. Contact angle of 166° indicates sample has a super-hydrophobic surface.

References:

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