Electronic Supplementary Information

Activated carbon derived from hydrothermal treatment of sucrose and its air filtration application

Shih-Wei Hao, Chia-Hao Hsu, Yang-Guang Liu, Bor Kae Chang*

There are two sets of data which are including background values and subtracting background values because the results were indirectly measured. To safeguard against debris entering the testing rig and also to avoid experimental error, a two-layer sample consisting of one sheet of air filtration paper sample and blank paper was used for filtration testing. Paper acts as a protection of air filtration paper and it was obtained from the same synthesized technique as air filtration paper. Finally, background values of filtration testing with only the blank paper was obtained. By use of the following set of equations, the background values of paper can be subtracted and resulting values listed in Table 1 were obtained:

Filtration efficiency: E_{total} = 1- $Penetration_{sample} \times Penetration_{background}$

Pressure loss: $P_{total} = P_{sample} + P_{background}$

where $Penetration_{background}$ = 95% and $P_{backgroun}$ = 1.6 mmH_2O for paper.

Here we offer another viewpoint to explain the filtration testing results. We compare the filtration efficiency, pressure loss and thickness of air filtration papers, paper and commercial air filter product. Thickness data of samples were added since we considered that thickness were related with pressure loss results. Thickness of each sample were measured by using a Mitutoyo Digimatic Micrometer on four corners of each sample and taking the mean value. The results suggest that the thickness of the air filtration paper is directly related to pressure loss. With greater thickness, pressure loss is higher, representing worse air permeability. However, commercial air filter product has a larger thickness but low pressure loss due to its thinner non-woven fabric fiber design. This type of optimization has not been taken into consideration in this work, which already clearly demonstrates that although the filtration efficiency is lower than commercial products, improvement over paper is clearly seen.

Table S1. The filtration testing results of air filtration paper and commercial air filter product.

	Including Background Values		**Subtracting Background Values**	
Notation	Solid Aerosol Filtration Efficiency (%) (0.26μm, NaCl, MMD)	Pressure Loss (mmH_2O)	Solid Aerosol Filtration Efficiency (%) (0.26μm, NaCl, MMD)	Pressure Loss (mmH_2O)
Filtration paper C2K2	9.50	3.1	14.03	1.5
Filtration paper C2K4	10.30	3.7	14.79	2.1
Filtration paper C6K2	10.30	3.3	14.79	1.7
Filtration paper C6K4	10.90	3.4	15.36	1.8
Commercial air filter product	NA	NA	57.99	0.6

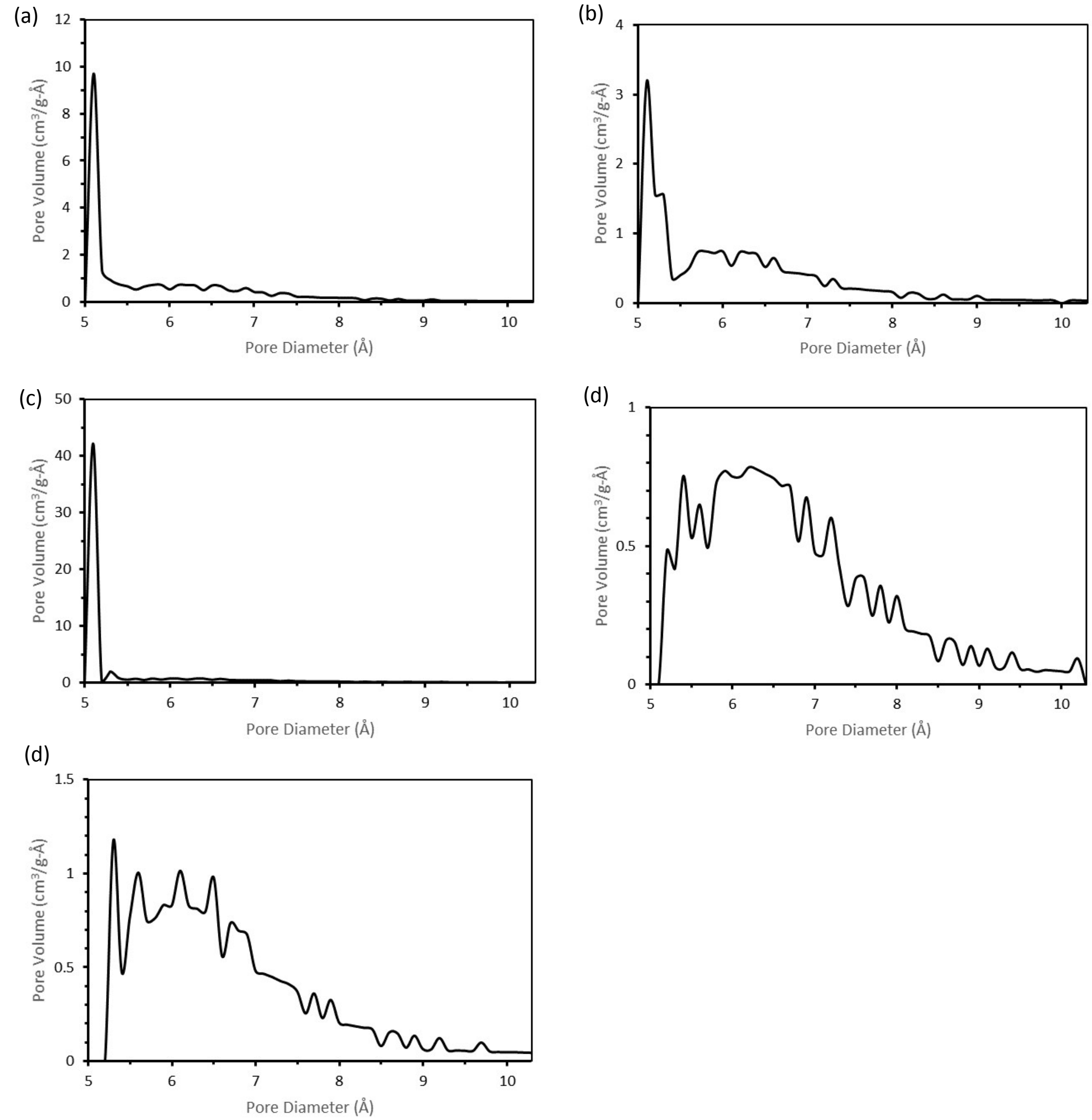

Figure S1. Pore size distribution of activated carbon described in this work. (*a*) HA-AC, (*b*) HB-AC, (*c*) HWN-AC, (*d*) HAN-AC, and (*e*) HBN-AC.