

## What to Look for in Gas-Phase HVAC Filters.

### Background:

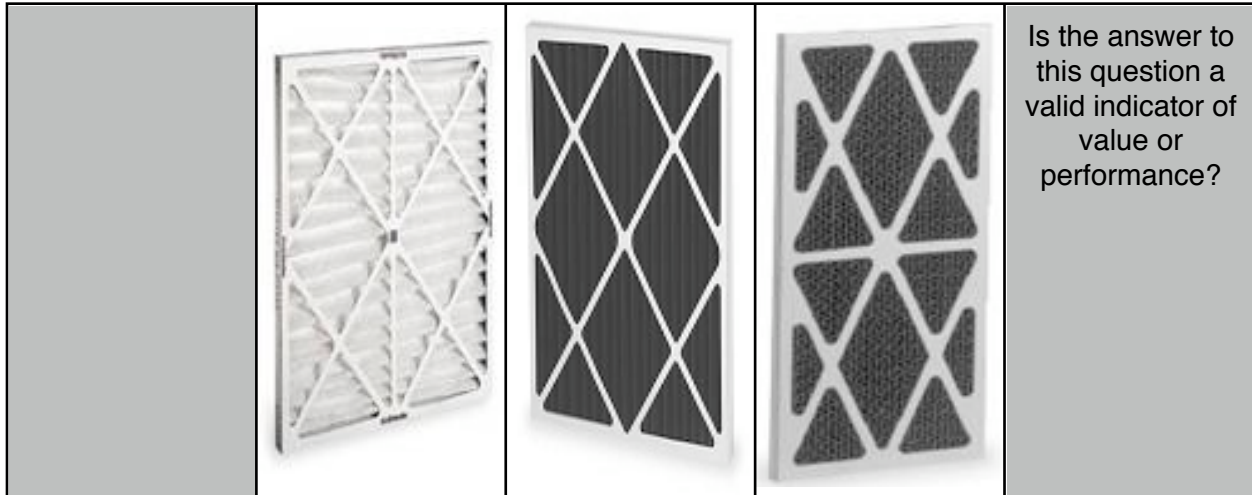
Surprisingly light concentrations (ppb to ppt) of pollutant molecules make indoor air unattractive. Carried in an air stream, these molecules “experience” a gas-phased HVAC filter for a few milliseconds. Short “windows of opportunity” results in molecules collecting only on the adsorbent’s outer surfaces. Hence, surface structures deeper than a fraction of a micron from the outer surface are wasted. Adsorbent filters offering insufficient outer surface area (outerSA) function poorly. Obviously, the challenge is to produce HVAC filters containing adsorbent which is entirely outerSA.

**OuterSA** determines performance:

granular activated carbon (GAC)	Gray Matter® adsorbent
number of granules:                    1	1,000,000,000,000
mass:                                        0.05 mg	0.05 mg
granule diameter: 1 mm (1,000 microns)	0.0001 mm (0.1 micron)
USmesh:                                    25	250,000
<b>outerSA:                                6 mm<sup>2</sup> ( )</b>	<b>60,000 mm<sup>2</sup> (the area of this page)</b>
<b>outerSA / mass:                    120 mm<sup>2</sup> / mg</b>	<b>1,200,000 mm<sup>2</sup> / mg</b>

**Comparing gas-phase (adsorbent) air filter types:**

2" x 24" x 24"



<b>FILTER:</b>				
color?	gray	black	black	no
price?	\$6	\$21	\$46	no
weight?	1.2 lb	2.4	5 lb	no
adsorbent content?	0.16 g	104 g	1900 g	no
odor-removal claims?	good	good	good	no
particle removal?	MERV 8	poor	poorer	-
<b>field performance?</b>	<b>good</b>	<b>poor</b>	<b>poorer</b>	<b>yes</b>
<b>longevity?</b>	<b>months</b>	<b>weeks</b>	<b>days</b>	<b>yes</b>
<b>ADSORBENT:</b>				
innerSA + outerSA / filter?	192 m2	156,000 m2	2,700,000 m2	no
<b>outerSA / filter?</b>	<b>192 m2</b>	<b>13 m2 *</b>	<b>3 m2</b>	<b>yes</b>
<b>outerSA / g?</b>	<b>1200 m2 / g</b>	<b>0.125 m2 / g</b>	<b>0.0016 m2 / g</b>	<b>yes</b>

<b>outerSA price / m2?</b>	<b>\$0.03 / m2</b>	<b>\$1.60 / m2</b>	<b>\$15.30 / m2</b>	<b>yes</b>
--------------------------------	--------------------	--------------------	---------------------	------------

\* assumes glue does not plug outerSA

© Richard Kunz, chemist 2003

Copyright 2007 BEC Technologies, Inc. | 1400 Mesa Ave., Colorado Springs CO 80906 |  
719.471.9172 (phone) 719.473.2461 (fax) | [gm@bec-tech.com](mailto:gm@bec-tech.com)