

CARBON MONOLITHS: NEXT GENERATION ACTIVE CARBON FOR WATER PURIFICATION

Monash has developed active carbon monoliths from brown coal that can be regenerated, are electrically conductive and have high surface area. Our carbon monoliths have several advantages over conventional active carbon granules or powder for water purification.

- Superior adsorption/ oxidation capacity
- High void fraction to suppress pressure drop
- Large surface area
- High mass transfer rate
- Efficient regenerability by application of a low voltage electric current

THE TECHNOLOGY

Activated Carbon Monoliths (ACM) are continuous hexagonal-shaped structures that have a high density and are electrically conductive.

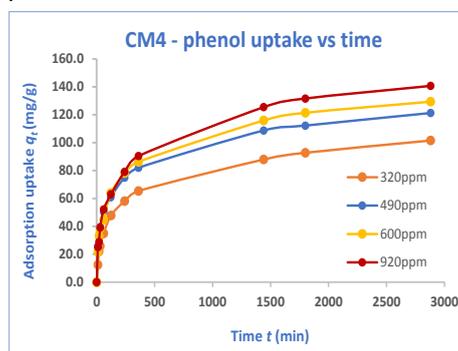


Samples	CO ₂ Surface area (m ² /g)	Conductivity (Ω ⁻¹ cm ⁻¹)	Compressive Hardness (MPa)
1kg VBC (formulation A)	970	100	120
1kg VBC (formulation B)	1200	250	180

ACMs are effective, superior adsorbent material compared to standard active carbon granules and powders. They can be used for the adsorption of a wide range of organic materials such as phenol, dyes, humic acid and formaldehyde, acetaldehyde and isopropanol as well as inorganic material such as phosphorous, arsenic or other heavy metals.

Usage Examples:

The prepared activated carbon monolith (CM4) was used to remove phenol from aqueous solution (40 ml) at a range of pH from 3 to 8. A maximum adsorption capacity of 159 mg/g was achieved at pH 6.



Additives can be incorporated into the ACM's to increase the adsorption / oxidation of targeted contaminants. Iron-doped activated carbon nanomaterials made from the same process as the monoliths was used for Fenton-like oxidation of methylene blue and showed superior performance of 100% decolorization after 30 minutes using 1g/l of sample at pH 6 and 15°C.



100% Decoloration after 30 mins.

Our novel ACM showed adsorption capacity superior to that of commercial honeycomb monoliths with activated carbon and literature reports.

The products present great potential as viable and effective industrial adsorbents for water treatment.

THE OPPORTUNITY

Monash is seeking a partner to develop and commercialise this technology.

THE CHALLENGE

The challenges in water purification using conventional active carbon granules or powder are:

- the pressure drop when using high flow of liquids
- the slow transfer rate of liquid
- no *in situ* regeneration.

A honeycomb monolith as a structure can overcome these issues however, the current products are expensive as they are made from premium materials and this represents a roadblock to their widespread use.

Monash technology has overcome these issues to create a novel product that has a high void fraction which suppresses the pressure drop when a high flow rate is used, the large surface area increasing the contact with reactant and high mass transfer rate. The activated carbon monoliths is a conductive single-piece permeable mass, can also be efficiently regenerated by applying a low voltage electric current to heat the adsorbent internally.

We have overcome the expense issue and still make a premium product by developing a hard extruded product directly from brown coal.

CONTACT US

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