Physical Features

• Hard Rock Mho’s >5, doesn’t break down in water
• Stable to heat to 1000C
• Very high hydrophilicity, but not high water retention
• Absorbent with internal honeycomb structure
Chemical Functions

Binds to & releases / exchanges cations

- The smaller, the quicker, in & out
- The bigger, the slower in, & difficult to remove
- Effective in heavy metal removal
- Used in decontamination of all nuclear accidents since 1953

CMZ is a sodium zeolite, but can be modified by acid wash to make a hydrogen zeolite

Is stable to all chemicals except pH>11 & HF
Applications

**Fine powders**
Cosmetics
Aquaculture
Industrial

**Powders**
Animal feeds & supplements

**Small Granules**
Flocking aids & Aquaria

**Granules**
Water filtration & treatment
Potting mix ingredient
Heating & cooling of air

**Large Granules**
Air filtration & treatment

**Small Rocks**
Air filtration & treatment
Decorative rocks
Pyrolysis

Burning combustible material, chiefly wood, without air produces Biochar
## Biochars: Problems & Issues

### Problems
- Needs heat to get going
- Requires quenching
- Light & fluffy
- Low density ~0.25
- Breaks down in water
- Product soft
- Lots of dust & fine particles
- Binding capacity & capability

### Issues
- Costly transport of wood
- May combust spontaneously in air
- Very messy
- Costly to transport
- Unsuitable for use in water
- Not effective as filtration medium
- Some danger to workers, black lung disease
- Somewhat limited
### Zeochar: Features & Benefits

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retains hardness of CMZ</td>
<td>Stable in water</td>
</tr>
<tr>
<td>Reasonable density (0.6-0.7)</td>
<td>Suitable for water filtration &amp; treatment</td>
</tr>
<tr>
<td>Dust minimized</td>
<td>Suitable for air filtration &amp; treatment at high $a_w$</td>
</tr>
<tr>
<td>Product easy to manage</td>
<td>Not too expensive to transport</td>
</tr>
<tr>
<td>Binds anions &amp; other</td>
<td>Workers not badly affected by dust</td>
</tr>
<tr>
<td></td>
<td>Workers go home relatively clean</td>
</tr>
<tr>
<td></td>
<td>Supplements CMZ absorbent by char adsorbent molecules</td>
</tr>
</tbody>
</table>
Modification of Zeochars

Modification improves functionality to bind anions notably Nitrate (NO$_3^-$) & Phosphate (PO$_4^{3-}$)
Not any old filter 1
Not any old filter 2
Putting it all together

Binding quantification
Zeolite 2.7% (2.7g NH4+/100g)
Zeochar 4.8% (4.8g NO$_3^-$/100g) &
  6.0% (6g PO$_4^{3-}$/100g)
Putting it all together

Quantification in the real world

With a 1T media load of Zeochar in the filter & assuming 80% efficiency, you could reasonably expect to bind the following:

\[
\begin{align*}
\text{NH}_4^+ & > 10\text{kg} \\
\text{NO}_3^- & > 9\text{kg} \\
\text{PO}_4^{3-} & > 12\text{kg}
\end{align*}
\]
PondSafe

Gentle treatment of blooms of algae, Cyanobacteria & water ferns in fresh water by removal of their mineral nutrition with no release with a single reagent, fine powdered Zeochar.
Intellectual Property

Zeochar is a Trade mark of CMZ
PondSafe is a Trade name of CMZ
A preliminary patent specification for Zeochar has been lodged with IP Australia & currently is under examination

The Thelepus filter is patented in Australia with me as inventor. CME is a shareholder in the IP.