Characterization and assessment of PAH content in spent char to be used for soil amendment and carbon sequestration

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Elemental Composition (CHNS)
Table 1: Elemental composition results (VarioEL III, Elementar Analysensysteme GmbH, Germany).

<table>
<thead>
<tr>
<th>Sample</th>
<th>C</th>
<th>N</th>
<th>H</th>
<th>S</th>
<th>H/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh GB</td>
<td>87.6</td>
<td>0.1</td>
<td>0.83</td>
<td>0.04</td>
<td>0.09</td>
</tr>
<tr>
<td>Spent GB, test A</td>
<td>90.9</td>
<td>0.53</td>
<td>0.22</td>
<td>7.35</td>
<td>0.03</td>
</tr>
<tr>
<td>Spent GB, test B</td>
<td>94.5</td>
<td>0.61</td>
<td>0.22</td>
<td>2.04</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Conclusion

Gasification char has promising characteristics for gas treatment and soil application for carbon sequestration purposes. When fresh GB is used for producer gas treatment at 800 °C for 2 hours, the following effects are observed:

- PAHs contamination decreases
- BET specific surface area decreases
- DFT pore volume decreases
- Carbon content increases

Specific surface area and porosity were found to decrease during gas treatment; nonetheless spent chars maintained acceptable surface properties. In addition, the PAHs contamination was found to decrease below the limit for premium grade biochar [6]. The carbon recalcitrance is expected to be higher for spent chars, as they contain soot black carbon derived from vapor phase tar. This form of carbon is considered as particularly stable [7]. The PAHs contamination assessment suggests that gas treatment application of GB may make it safer for soil application and carbon sequestration.