Supplementary Materials

Table S1. Experimental Operation Conditions for All Column Experiments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>ESC</th>
<th>GAC</th>
<th>ESC-GAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Rate (Q)</td>
<td>mL/min</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Diameter (D)</td>
<td>cm</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Length (L)</td>
<td>cm</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Porosity (n)</td>
<td></td>
<td>0.45</td>
<td>0.48</td>
<td>0.46</td>
</tr>
<tr>
<td>Adsorbent Mass (Mₐ)</td>
<td>g</td>
<td>29.3</td>
<td>28.7</td>
<td>29.1</td>
</tr>
<tr>
<td>Hydraulic Loading (u)</td>
<td>cm/min</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>EBCT</td>
<td>min</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>

Table S2. Comparison of Breakthrough Adsorption Capacity (qₜ) Obtained in This Work with the Results of Other Researchers

<table>
<thead>
<tr>
<th>Adsorbent</th>
<th>qₜ</th>
<th>tₜ</th>
<th>tₛ</th>
<th>HLR</th>
<th>EBCT</th>
<th>Cᵢₙ</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>CES</td>
<td>3.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CES-GAC</td>
<td>3.34</td>
<td>8 d</td>
<td>NR</td>
<td>0.4</td>
<td>20</td>
<td>6.7</td>
<td>This study</td>
</tr>
<tr>
<td>GAC</td>
<td>3.28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn Cob</td>
<td>2.14</td>
<td>&lt; 1 h</td>
<td>24 h</td>
<td>1.27</td>
<td>7.9</td>
<td>100</td>
<td>(49)</td>
</tr>
<tr>
<td>Pinus pinaster bark</td>
<td>0.38</td>
<td>7.5 min</td>
<td>NR</td>
<td>2.21</td>
<td>6.8</td>
<td>100</td>
<td>(50)</td>
</tr>
<tr>
<td>Sugarcane bagasse</td>
<td>5.06</td>
<td>80 min</td>
<td>195 min</td>
<td>4.7</td>
<td>6.8</td>
<td>20</td>
<td>(51)</td>
</tr>
<tr>
<td>Garlic Peel Powder</td>
<td>13</td>
<td>160 min</td>
<td>340 min</td>
<td>7.1</td>
<td>2.1</td>
<td>50</td>
<td>(52)</td>
</tr>
<tr>
<td>Modified Coal Fly Ash (MCFA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- in pulp mill wastewater</td>
<td>1.01</td>
<td>130 min</td>
<td>NR</td>
<td>1.27</td>
<td>10.6</td>
<td>78</td>
<td>(53)</td>
</tr>
<tr>
<td>- in paper mill wastewater</td>
<td>1.54</td>
<td>198 min</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

qₜ: Adsorption capacity (mg/g) at breakthrough time; tₜ: Breakthrough time; tₛ: Saturation time; HLR: Hydraulic Loading Rate (cm/min); EBCT: Empty Bed Contact Time(min); Cᵢₙ: Influent phenols concentration (mg/L)
Fig. S1. Schematic drawing of the column experimental setup.

Fig. S2. PSD of raw leachate (a) and leachate pretreated by coagulation-flocculation at alum dosage of 3.5 g/L (b).
**Fig. S3.** pH (a) and EC (b) of leachate effluent from all columns. The pH and EC values at PV = 0.0 represents the influent values. (T = 25°C, Q = 1.25 mL/min, HLR = 0.4 cm/min, EBCT = 20 min)
Fig. S4. Breakthrough curves of TN in ESC and GAC columns. (T = 25°C, Q = 1.25 mL/min, HLR = 0.4 cm/min, EBCT = 20 min)