Supporting Information:

Adsorption isotherm study:

The linear equation for Langmuir and Freundlich isotherm models are expressed as follows:

\[
\text{Freundlich isotherm} : \log q_e = \log K_F + \left(\frac{1}{n}\right) \log C_e \quad \text{(3)}
\]

\[
\text{Langmuir isotherm} : \left(\frac{C_e}{q_e}\right) = \left(\frac{1}{Q_o}\right) + \left(\frac{C_e}{Q_o}\right) b \quad \text{(4)}
\]

Where \(K_F\) (mg g\(^{-1}\)) is the Freundlich constant and ‘n’ the Freundlich exponent. Where \(q_e\) (mg g\(^{-1}\)) is the adsorbed amount of Hg (II) at equilibrium, \(C_e\) (mg L\(^{-1}\)) is the equilibrium concentration of Hg (II), \(Q_o\) (mg g\(^{-1}\)) and \(b\) (L mg\(^{-1}\)) are Langmuir constants related to adsorption capacity and energy of adsorption. Additional, the important characteristics of the Langmuir isotherm can be explained separation factor \(R_L\), which is calculated by the equation 4.\(^{24}\)

\[
R_L = \frac{1}{1 + bQ_o} \quad \text{(5)}
\]

The \(R_L\) value assumes the nature and the feasibility of adsorption process are specified in Table 1.

**Table 1 Nature of adsorption isotherm**

<table>
<thead>
<tr>
<th>(R_L) value</th>
<th>Adsorption process</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R_L &gt; 1)</td>
<td>Unfavorable</td>
</tr>
<tr>
<td>(R_L = 1)</td>
<td>Linear</td>
</tr>
<tr>
<td>(0 &lt; R_L &lt; 1)</td>
<td>Favorable</td>
</tr>
<tr>
<td>(R_L = 0)</td>
<td>Irreversible</td>
</tr>
</tbody>
</table>
Adsorption kinetics study:

The pseudo-first-order kinetic model can be expressed as:\(^{31}\)

\[ \log (q_e - q_t) = \log q_e - \left[ \frac{k_1}{2.303} \right] t \quad \text{----------------- (6)} \]

Where \( k_1 \) is the pseudo-first-order rate constant (min\(^{-1}\)) and \( q_e \) (mg g\(^{-1}\)) is the adsorption capacity at equilibrium and \( q_t \) (mg g\(^{-1}\)) is the adsorbed amount of metal ion after time \( t \) (min).

The pseudo-second-order kinetic model can be expressed as:\(^{32}\)

\[ \frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e} \quad \text{----------------- (7)} \]

Where \( k_2 \) is the pseudo-second-order rate constant (g mg\(^{-1}\) min\(^{-1}\)).

**Intra-Particle diffusion model:**

The equation for intra-Particle diffusion model can be expressed as

\[ q_t = k_{id} t^{1/2} + C \quad \text{----------------- (8)} \]

Where, \( q_t \) is the adsorption capacity at any time \( t \) and \( k_{id} \) is the intra particle diffusion rate constant and \( C \) is the film thickness.