Activated carbons are characterized with well-developed system of micro- and macro-
pores and high surface area on which the molecules of organic compounds are adsorbing very
strongly. Granular activated carbons due to homogeneous hydrophobic surface are the
important sorbents for uptake of various organic impurities from contaminated water media.

The main purpose of this work was to test the theory of volume filling of micropores
(TVFM) equations applicability for the description of intermolecular interaction of
hydrocarbons with the surface of two carbons AG3 and BAC and for the modeling of physical
adsorption on graphite surface and the formation of monomolecular films.

For the description of isotherms of physical adsorption from water solutions on solid
surface we used the modified DR equation in following form

\[ n = w_o / V \exp[-(A/\beta E_o)^2] \]  \hspace{1cm} (1)

and in form known as DS (Dubinin - Stoeckli) equation

\[ n = (w_o / 2BV) \exp(-mb^2A^2 / B^2)[1 + erf(b / \sqrt{2B\delta})] \]  \hspace{1cm} (2)

where \( A = RT \ln(c_o / c) \), \( \beta \) is affinity coefficient, \( m = 1/\beta b E_o \), volume \( V \) is a molar volume of
hydrocarbon, \( B = (1 + 2m\delta^2A^2)^{1/2} \), \( w_o = w_{o1} + w_{o2} \) expresses the micro- and
supermicropores volumes, \( b \) is half-breadth of slit micropores, \( \delta \) is a standard deviation, \( c/c_o \) -
relative concentration.

The parameters characterizing the physical adsorption dynamics were calculated using
the Silov equation

\[ \tau = kZ - \Theta \]  \hspace{1cm} (3)

where \( \tau \) and \( \Theta \) are the times of protection action and action waste, respectively, \( Z \) is the layer
bed height and \( k = n/uc \). From this equation the expression for \( \tau \) as the work time of adsorber
was obtained as

\[ \tau = kZ - 2Rke/(1-\varepsilon) - R^2\varepsilon / 6D(1-\varepsilon) \]  \hspace{1cm} (4)

where \( 2R \) is granule size, \( \varepsilon \) is the adsorber porosity and \( D \) is the diffusion coefficient.

The comparison of \( w_o \) values calculated by DR and DS equations suggests that the
contribution of hydrocarbons physical adsorption on mesopore surface in total physical
sorption process plays the crucial role. The thermodynamic parameters calculated from
experimental data were used in mathematical model for physical adsorption process of water
purification. The DR and DS equations are applicable as well for the description of the
intermolecular interactions of hydrocarbons with porous carbon surface. The results obtained have shown that both carbons possess the ability for removal the micro impurities from water. The proposed model of physical adsorption dynamics was satisfactory described the removal hydrocarbon molecules from water by carbons and the formation of monomolecular film of hydrocarbon on graphite surface.

Table. Parameters of DR and DS equations for studied Carbons

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<thead>
<tr>
<th>Solute</th>
<th>Carbon</th>
<th>DR</th>
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<tr>
<td></td>
<td></td>
<td>$w_o$, cm$^3$/g</td>
<td>$h$, nm</td>
<td>$E_o$, kJ/mol</td>
<td>RSD %</td>
<td>$w_o$, cm$^3$/g</td>
<td>$h$, nm</td>
<td>$E_o$, kJ/mol</td>
<td>$\delta$, nm</td>
<td>RSD %</td>
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<tr>
<td>Benzene</td>
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<td>8.6</td>
<td>2.6</td>
<td>0.33</td>
<td>1.60</td>
<td>7.5</td>
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<tr>
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