Adsortion and photodegradation studies were done under UV irradiation on surfactants solutions and on their mixtures with heavy metals (copper and cadmium) in system using fly ash (CPH-Brasov, Romania), coated with a wide band gap semiconductor (Degussa P-25 TiO₂) modified with NaOH 2n solution. This substrate was obtained by hydrothermal process and is noted FATiO₂ ht. The TiO₂ film on fly ash support (FATiO₂ ht) demonstrates a high activity for photodegradation of surfactants and high adsorption for heavy metals.

The amount of cationic surfactant adsorbed per surface area unit was calculated from surface tension using (Contact Angle System CA20).

The results indicate parallel adsorptions of heavy metals and surfactants from mixed solutions. The results show that, fly ash with controlled surface properties allows the adsorption and photodegradation on FATiO₂ ht. The aqueous surfactants were prepared below CCM.

RESULTS AND DISCUSSIONS

Time, mass, concentration influence, on the adsorption efficiency of Cd²⁺, Cu²⁺, SDBS and HTAB from multicomponent systems

\[ \eta = \frac{C_{s0} - C_{e}}{C_{s0}} \times 100 \]

\[ \eta = 100 \times \frac{(A_{\text{ads}} - A_{\text{cal}})}{A_{\text{ads}}} \]

Cd²⁺, Cu²⁺, immobilization on FATiO₂ ht from multicomponent system t_{system} = 120 min for surfactants and 90 min for Cd²⁺, Cu²⁺

Kinetic parameters of the Cd²⁺ and Cu²⁺ adsorption and photodegradation

<table>
<thead>
<tr>
<th>FATiO₂ht</th>
<th>Pseudo-first order kinetics</th>
<th>Pseudo-second order kinetics</th>
<th>Interparticle Diffusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>FATiO₂ht</td>
<td>[ Q_e = \frac{k_1 t}{1 + k_1 t} ]</td>
<td>[ \frac{Q_e}{t} = \frac{1}{k_2 + C} ]</td>
<td>[ \frac{Q_e}{t} = \frac{1}{1 + \frac{k_2}{C} t} ]</td>
</tr>
<tr>
<td>FATiO₂ht</td>
<td>( t_{1/2} = \frac{1}{k_1} )</td>
<td>[ t_{1/2} = \frac{Q_e}{k_2 + C} ]</td>
<td>[ t_{1/2} = \frac{1}{k_2} ]</td>
</tr>
</tbody>
</table>

The new type of substrate was investigated as substrate for complex adsorption and pollutant degradation.

The new substrate fly ash has a rough surface with a large amount of high energy sites. By further alkaline treatment the surface becomes smoother with a larger amount of meso- pores. These changes result in a controlled adsorption affinity. The substrates proved to be highly efficient in the heavy metal adsorption and photodegradation of dyes.

The efficiency of the adsorption process is more high that of photodegradation process with this substrate which can be opaque.

The pseudosecond order kinetics describes well all the processes at medium and low heavy metals ions initial concentrations.

The adsorption process of heavy metal in the experimental conditions is significantly controlled by diffusion and the low volume – high mobile copper cations has a faster.

The results of the sorption experiments suggest that this substrate can be applied in environment technology as an good immobilizer of heavy metal and for surfactants.

The data show that, more types of substrates with fly ash and semiconductors (TiO₂) are nanomaterials which can be obtained in hydrothermal conditions.

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