The main components of FAWO 3 are: different mixed compounds of SiO₂, Al₂O₃ and WO₃ triclinic and monoclinic.

The new type of substrate was investigated as substrate for complex adsorption and/or as ion exchange processes involving tri-component, heavy metal and dyes pollutants. This process can be more complex because the FAWO composition includes 9.5% Fe₂O₃ and MnO₂ which can participate in photocatalysis and adsorption based on a mixture of catalysts and fly ash.

EXPERIMENTAL

**Substrate: Tungsten Oxide and Fly Ash - Mixture**

- Fired coal FA, collected from the Brasov - Romania CHP plant, (from the filters).
- The compositions of raw FA. According to the ASTM standards, the FA - type F.

### XRD of the (A) FA, (B) FAWO₃, and (C)WO₃

- The successfull transformation: kaolinite, geleline, Na₂, magheline-Q, syn, kyanite, quartz, Na₁₋₅W₀₃ (mulite, cristobalite sodium aluminum silicate, clinoptilolite, phillipitobornonite oxide Fe₂O₃)
- The main components of FAWO₃ are: different mixed compounds of SiO₂, Al₂O₃ and WO₃ triclinic and monoclinic.

### AFM topography, average roughness:

- (a) FA
- (b) WO₃
- (c) FAWO₃

### Adsorption

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<th>Photo. BB/min</th>
<th>%</th>
<th>Adsortion BB/min</th>
<th>%</th>
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### Keywords:

Fly ash, tungsten oxide, dyes, heavy metal removal, adsorption, photocatalysis, wastewater treatment.

Heavy metal solution: CuCl₂, 2H₂O (Scharlau)

**Concentration measurements:**

- Cations: AAS (Analytic Jena ZEEnit 700)  \( \lambda_{cu} = 324.75 \text{ nm} \)
- Dyes: Perkin Elmer Lambda 25  \( \lambda_{bb} = 629 \text{ nm} \)
  \( \lambda_{br} = 501 \text{ nm} \)
- Adsorption and photodegradation experiments:

  Batch experiments, stirring, at 22-24°C

Substrates: WO₃, FAWO₃, Cu²⁺ Efficiency

**RESULTS AND DISCUSSIONS**

**Time, mass, concentration influence, on the adsorption efficiency of Cu²⁺, BB and BR from multicomponent systems**

**VH₂O₂ pH influence, on the adsorption and photodegradation efficiency of Cu²⁺, BB and BR from multicomponent systems**

This process can be more complex because the FAWO composition includes 9.5% Fe₂O₃ and MnO₂ which can participate in the adsorption or generation of hydroxyl radicals.

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