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Treatment of Uranium-Containing Effluent in the Process of Metallic Uranium Parts

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Abstract The anion exchange method used in treatment of uranium-containing effluent in the process of metallic parts is the subject of the paper. The results of the experiments shows that the uranium concentration in created water remains is less than 10 μg/l when the waste water flowed through 10000 column volume. A small facility with column volume 150 litre was been installed and 1500 m^3 of waste water can be cleaned per year.

It is well known that metallic uranium-238 is a material to produce the nuclear fuel. However, in the process of machine work a great mass of metallic uranium chips will be generated and cooling water and flushing water will be contaminated. when the chips being accumulated to a certain degree, they will be on fire, and then the environment will be polluted. For sake of safety, the chips are usually immersed in water, and then extruded into discuses, so as to be stored respectively. In such a way that it needs a few tons of immersing water per year. Though the volume of the water is not very large, uranium concentration is hundreds mg/l. The water is usually cured in cement. The volume of cooling water and flushing water is so lasrge as 1500 m^3/a and its chemical composition and features are shown in Table 1. Because of the function of HCO_3^- ion, a part of metallic uranium chips will be dissolved and uranium concentration in the water is about 1000~2000 μg/l. The chemical reaction is:

$$U + 3HCO_3^- + 3/2O_2 = [UO_2(CO_3)_3]^{4-} + H^+ + H_2O$$

For the low activity waste water, chemical treatment is effective, but a great quantity of mud which was formed in the process is difficult to treated further. The anion exchange resin is of highly selective adsorbability to $[UO_2(CO_3)_3]^{4-}$, therefor the anion ion exchange technique was studied in the paper and used for the treatment of uranium containing fluent.

Table 1. Waste composition and features

Hardness of raw water	90 mg cao/l	Hg	22 mg/l
Alkalinity	2.2 meq. /l	Chloride	9.7 mg/l
Bicarbonate (HCO_3^-)	130 mg/l	Sulphate	13 mg/l
Ca	46 mg/l	pH	6-7