

Au sorption by natural and synthetic sorbents using ^{195}Au

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Sorption of ^{198}Au labeled with a radioactive isotope ^{195}Au , by natural (goethite (G), montmorillonite (M), pyrolusite (P)) and synthetic (Fe hydroxide (SFe)) sorbents was studied. The experiments were carried out in 3 media in which Au sorption is possible under hypogene conditions: pH 2.25 (HCl), 6.8 (H₂O-distilled), 8.98 (NH₄OH). The concentration of dissolved stable Au in the initial solutions was 1 mg/L (10^{-3} g/L) in the first case and 10 mg/L (10^{-2} g/L) in the second, and 10^{-8} g/L ^{195}Au was in both cases. Sorption was carried out for 60 h at 25 °C using a shaker. After that solutions were centrifuged and filtered through membrane filters; aliquotes and sorbents were analyzed by gamma spectrometry using scintillation detector NaI(Tl). The occurrences of Au in sorbents was studied by film autoradiography.

At an initial Au concentration (10^{-3} g/L), the maximum sorption is observed in an acidic medium, and the minimum in an alkaline one, among sorbents: SFe (max) > P > M > G (min). Whereas at 10^{-2} g/L Au, the maximum sorption is observed in an alkaline medium among sorbents (from max to min): P – SFe – G – M. In comparison with Au sorption from solutions with ultra-small (10^{-9} – 10^{-8} g/L Au) and small concentrations (10^{-8} – 10^{-6} g/L Au) [1, 2], the results of this study indicate a significant effect of Au content in solution on its sorption by G and M. Gold sorption by G and M decreases with increasing pH (max in an acidic medium) in solution with ultra-small and small contents [1, 2].

The autoradiography data shows that a large amount of micro and nano-particles of native Au is formed along with gold sorption occurrence (homogeneous distributed in the sorbent) with increasing Au concentration from 10^{-3} to 10^{-2} g/L. They are evident as point with the maximum optical density of the nuclear emulsion.

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[1] Krendelev, F.P., et al., *Geochem.Inter.*, 1978, 15(1), 156-162. [2] Zhmodik, S.M., et al., *Litologiya i poleznye iskopaemye*, 1980, 3, 153-158. (in Russian).