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Heavy metal biosorbents based on activated sludge micromycetes

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Abstract

The extraction of heavy metals from the waste water of the galvanic industry with biosorbents is considered to be a more economical method than using traditional sorbents such as ion-exchange resins and activated carbons. In this paper we studied the biosorption of copper, zinc and nickel ions by the biomass of cultures of mold fungi isolated from active sludge of water treatment plants – *F. nivale*, *F. oxysporum* and *P. glabrum*. Selected microorganisms spontaneously form strong biomass granules, resistant to high doses of heavy metals, which allows them to sorb metals in large quantities. All three studied fungal cultures appeared to be promising for the creation of heavy metal biosorbents, however, the sorption intensity of copper ions is an order of magnitude higher than that for zinc and nickel. For the purpose of copper sorption, it is most expedient to use the biomass of the *F. oxysporum* culture, which has a sorption capacity of more than 400 mg/g for this metal. Zinc and nickel ions most actively absorb the biomass of the *P. glabrum* culture, which sorbs 35 mg of nickel or 70 mg of zinc per gram of dry biomass.

The biosorbents obtained in the course of the investigation quickly recover metal ions from solutions: the optimum sorption time is from 3 minutes in the case of copper to 15-20 minutes when the nickel and zinc ions are extracted. The values of the acidity of the medium, optimal for effective sorption, are determined. Zinc ions are most actively sorbed at pH 5.5, while nickel and copper ions fungi biomass absorbs most efficiently at pH 7 and 9, respectively. It was noted that at different pH values of the medium and using various fungal cultures as sorbents, the metal ions are sorbed with unequal intensity. Therefore, these cultures can be used as selective sorbents of heavy metals. Gradually alkalizing effluents of galvanic production, or sequentially adding granules of various fungal sorbents to solutions, it is possible to organize separate extraction of copper, zinc and nickel ions.

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