

Optimization of sorption properties of cation exchanger FIBAN K-6

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With the development of chemisorption technologies, selective and inexpensive fibrous sorbents obtained from available raw materials acquire great importance for solving environmental problems. Aminocarboxyl cation exchanger FIBAN K-6 developed at the IPOCh of NAS of Belarus on the basis of polyacrylonitrile fiber is promising for use in purification of technical and drinking water from copper, lead and cadmium cations [1].

The effect of crosslinking and conditioning on the physicochemical and sorption properties of this sorbent has been investigated. Epichlorohydrin was applied as a crosslinking agent. Conditioning was carried out by alternate triple treatment of the cation exchanger with 0.5 M NaOH, H₂O and 0.5 M HCl.

It was found that the use of epichlorohydrin as a crosslinking agent reduced swelling of FIBAN K-6 samples and contributed to the stability of the fiber geometric shape. Samples of cross-linked cation exchanger FIBAN K-6M provide 1.5 times higher dynamic capacity before slipping of MPC of copper and lead ions as well as 2-3 times higher volumes of treated water (Table).

Samples of FIBAN K-6 and FIBAN K-6M	Number of column volumes of water, purified from cations to the MPC level					
	Cu ²⁺	Pb ²⁺	Ni ²⁺	Co ²⁺	Cd ²⁺	Zn ²⁺
Non-cross-linked, non-conditioned	828	993	<497	331	745	497
Cross-linked, non-conditioned	1108	1385	277	<277	554	277
Cross-linked, conditioned	2367	3943	<592	<394	1183	592

Conditioning of cation exchanger FIBAN K-6M leads to an increase in the exchange capacity of the exchanger by carboxyl groups with a simultaneous decrease in the amino group content, and also improves the dynamic sorption capacity by more than 2 times compared to the non-cross-linked sample of FIBAN K-6. The amount of purified water increases by up to 4 times.

References

[1] G.V. Medyak et al. Proceedings of the XI International Water and Chemical Forum, Minsk (2018) 106.