

# Bentonites with Immobilized Organophosphorus Complexing Ligands as Adsorbents for the Removal of Toxic Metals from Natural Water

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*The article deals with synthesis of bentonite-based materials with covalently immobilized organophosphorus complexing agents: N-methylpropylamino (Bnt-MAPA) and propylaminodi- (Bnt-ADPA) methylene-phosphonic acids. The organo-bentonites were characterized by powder X-ray diffraction, FTIR, and <sup>31</sup>P NMR spectroscopy. It is demonstrated that interlayer spacing in bentonites is increased upon silanization up to 51% that essentially improved filtration properties of the adsorbents. The concentration of immobilized chelating groups was found from pH-potentiometric titration as 0.35 and 0.60 mmol/g for Bnt-MAPA and Bnt-ADPA, respectively. In the pH range 3-8, the organo-bentonites adsorb up to 0.19 mmol/g of Fe(III), Pb, Cu, Zn and Cd ions during 15 minutes. All studied ions (except Cd) can be completely removed from water solution with pH > 6.5. The metal adsorption on the organo-bentonites is completely reversible and allows the adsorbent multiple utilization, with the metal recovery 90-95%. The organo-bentonites were used for purification of water samples from Lybid river (Kiev region). Complete removal (>97%) of Pb and significant decrease (59-65%) of Cu and Zn ions was achieved upon simple filtration. X-ray fluorescence analysis showed an increase in the content of Ca, Pb, Cu, Zn, Mn, and Sr in the phase of adsorbent after its utilization for filtration.*

**Keywords:** organo-bentonites, adsorption, water treatment, organophosphorus complexones, immobilized ligands

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