

GLAUCONITE-QUARTZ COMPOUNDS APPLIED FOR THE REMOVAL OF HEAVY METALS FROM AQUEOUS SOLUTION – COLUMN STUDY

FRANUS, M.

Department of Geotechnics, Lublin University of Technology, Nadbystrzycka 40, 20-618 Lublin, Poland
E-mail: m.franus@pollub.pl

Glauconite concentrate was separated by sieving (>63 μm) and magnetic fractionation from sandy deposits of the Lubartow Lowland (Eastern Poland, GAZDA *et al.*, 2002). Glauconite belongs to polytype 1M which characteristic for high ordering of the structure (FRANUS *et al.*, 2004). The aim of the present study is to determine the sorption properties of filtration mixtures, composed of variable contents of glauconite (5 wt% – G5, 10 wt% – G10, 50 wt% – G50, 100% – G100) and quartz. Sorption properties were measured on standard solutions of the following heavy metals: Pb(II), Zn(II), Cd(II), Cu(II)

Four filtration mixtures were placed into glass columns. The mass of each mixture was 12 g, giving the thickness of deposit 0.08 m. After all tests, the runs of planar isotherms were plotted. On the basis of breakpoint, the total adsorption capacity (TAC) and the efficient sorption capacity (EAC) were calculated for each mixture.

During running off the filtrates G5 and G10, the increase of Zn and Cu ions content was observed while even only 50 ccm of solution was eluted from the column. Full saturation took place at volume in range from 280 to 480 ccm of effluent. During removal of Zn and Cu from solution by the sample G50, the breakpoint was detected at 470 ccm of effluent and the saturation of the sorptive complex appeared at 1050 ccm. The concentration of Cu ion in solution passing through the bed G100 increase at volume 910 ccm, and the bed is exploited at 150 ccm of effluent.

Beds G5 and G10 adsorb Cd ion in a way similar to Zn and Cu. For the G5 bed the breakpoint was observed at 50 ccm and for G10 – at 150 ccm of effluent. Saturation of Cd ion takes place at 450 and 560 ccm, respectively. The highest efficiency of Cd adsorption occurs while using fil-

trates G50 and G100, showing breakpoints at 790 and 1430 ccm and full saturation at 1430 and 2190 ccm of effluent, respectively.

Tested filtration mixtures showed the best efficiency for lead adsorption, in relation to the applied heavy metals. For beds G5 and G10, the breakpoint occurs at 200 and 2500 ccm of effluent volume, and the saturation takes place at 700 and 850 ccm, respectively. Saturation of bed G50 was found at 2040 ccm and the breakpoint – at 1520 ccm. The bed G100 turned to be the best adsorbent. The breakpoint was observed at 2910 ccm and saturation takes place at 3510 ccm.

The total and efficient adsorption capacities rise following the content of glauconite in filtration mixtures. Test of adsorption on beds G5 and G10 showed equal EAC values yielding 215 mg/kg for Zn and 212 mg/kg for Cu. Their TAC values are generally twice higher than EAC values. The highest TAC and EAC values were calculated for Pb adsorption by all tested samples.

Concluding: the TAC is higher than EAC for all tested mixtures. The highest TAC value is characteristic for G100 sample and the lowest TAC occurs for G5 sample.

This work was financially supported by the Polish Ministry of Education and Science, grant No 3 T09D 007 28.

References

- FRANUS, W., KLINIK, J. & FRANUS, M. (2004): *Mineralogia Polonica*, 35: 53–62.
GAZDA, L., FRANUS, M., FRANUS, W. & KRZOWSKI, Z. (2002): In: PAWŁOWSKI L. (ed.): *Monografie Komitetu Inżynierii Środowiska PAN*, 11: 715–719.