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REGULATION OF CLAY PARTICLES CHARGE FOR DESIGN OF PROTECTIVE ELECTROKINETIC BARRIERS

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Highlights

- Clays can be used as a material for electrokinetic protective reactive barriers;
- Alkaline treatment results in negative charge of clay particles, whereas acidic treatment cause positive charge of clay particles;
- Positively charged clay particles will presumably bind anionic toxicants and negatively charged particles will adsorbs cationic toxicants;
- Change in surface charge properties of clays and protective characteristics of barrier occurred at point of zero charge (p.z.c.);
- P.z.c. values for clays of various mineral types were determined, in raw 'kaolin/illite clay/montmorillonite clay' p.z.c. values shift to alkaline area.

Abstract

Coupled electrokinetic protective reactive barriers (PRB) are considered as a perspective technology for the treatment of contaminated groundwater. Design of PRB is directly connected with a problem of barrier material choice. Clays can be considered as an appropriate material due to high adsorptive properties and relative cheapness. The barrier internals are formed by clay surface charge properties. We revealed that acidic and alkaline treatment of clay is an effective way to affect its protective properties so that clay can be used to treat various pollutants. Surface charge and electrokinetic properties of clays were characterized by point of zero charge (p.z.c.), point of zero net proton charge (p.z.n.p.c.) and ζ-potential at different pH. Suspensions of 3 main clay types were studied by microelectrophoresis and potentiometric titration methods. At pH>p.z.n.p.c. clayey barrier adsorbs predominantly cationic toxicants and at pH<p.z.c. – anionic ones. The barrier is seemed to be the least effective in pH range between p.z.c. and p.z.n.p.c. Given the physicochemical and electrokinetic parameters, the most efficient clays for barrier design are Cambrian illite and all montmorillonite clays.

Key words:

electrokinetic barrier; pollution treatment; ζ-potential; point of zero charge; point of zero net proton charge