Silicon (28% wt.) and aluminium (8%) are second and third most abundant elements in Earth’s crust. In groundwaters, including the medicinal ones, both elements occur in proportionally lower concentrations than the less abundant elements of lithosphere, such as Ca, Mg, Na, K. The primary sources of Si and Al in water are represented by aluminosilicate minerals. Various minerals have been indicated as phases which could control the solubility of silicon and/or aluminium in water. Hydroxyaluminosilicate (HAS) colloids have been also suggested as such a phase (Schneider et al., 2004). In conjuction with that the formation and structure of synthetic HAS colloids, along with their ecotoxicological role were studied (e.g. Doucet et al., 2001; Exley, 2012). Evaluation of a large set of natural water chemical analyses suggested that one of HAS colloids, the HAS$ _B$ type of a $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$ composition, might be formed in groundwaters (Dobrzynska, 2007).

This work presents an attempt to confirm this hypothesis by investigating the presence of HAS$ _B$ colloid in groundwater. It includes analysis of 219 fresh and mineral groundwater samples from Poland, Spain, and Malaysia. An analytical method involving ion-exchange resin was first tested on synthetic solutions and then applied for indirect identification of HAS$ _B$ in groundwaters. Additionally, the investigated water samples were subjected to micro- and ultra-filtration, and then the collected solids were analysed by XRD, EDS and SEM. The HAS colloids may have an important place in Si and Al hydrogeochemistry, especially in near-surface environments, and in eco-toxicology due to their role in limiting the concentration of bio-available and toxic aluminium species.

This study concludes that the most promising conditions for the HAS$ _B$ presence were found in silicon-rich medicinal waters from the Sudetes Mountains (Poland), especially from Swieradow Health Resort. The Si:Al molar ratio found in this work in eluates from resin prepared using waters from Swieradow showed values close to the theoretical ratio of 1:1.

This work also discusses and indicates that the most preferential settings for formation of HAS colloids occur at the short groundwater turn-over time zone in crystalline aquifer-rocks. It also discusses the mechanism for masking the presence of HAS$ _B$ colloids in water by other aluminosilicates. The presented results are still preliminary and require additional work aiming at development of analytical methods applicable for water suspensions rich in silicates.

**Keywords:** Silicon, Aluminium, Hydroxyaluminosilicate colloids, Medicinal water, Poland
References


