

## Carbon dioxide sequestration based on alkaline residues

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Amongst various CO<sub>2</sub> sequestration scenarios, mineral trapping is regarded as one promising technique because it warrants a permanent and inherently safe storage of CO<sub>2</sub> (Lackner *et al.*, 1995, Zevenhoven *et al.*, 2006). The carbonation of Ca- and Mg-bound minerals is fairly simple in process even so fast reaction kinetics are required for a technical realization. The energy input for the technical process is dependent on different materials and therefore the net amount of CO<sub>2</sub> sequestered (Huijgen *et al.*, 2006). Alkaline residues from combustion processes are favorable for CO<sub>2</sub>-binding because they are cheap, highly reactive and are generated as byproduct from the process of power generation.

In the present work, the reaction of alkaline brown coal fly ashes with CO<sub>2</sub> was studied in aqueous suspension in order to 1) develop a technical process for carbonation that removes CO<sub>2</sub> from flue gas of a powerplant sufficiently fast and 2) to generate an alkalinity-containing solution ready for the injection into deep aquifers. Laboratory experiments were performed in an autoclave system to measure the CO<sub>2</sub> transfer as a function of solid-liquid ratios, CO<sub>2</sub> partial pressure and stirring rates. Mild process conditions (25-50° C, atmospheric gas pressures) were chosen in order to evaluate the storage capacity under low economic and energy costs.

We could achieve an uptake of more than 2 mol CO<sub>2</sub> per kg of the used fly ash. Considering the average amount of fly ash accumulated within combustion process this corresponds to a reduction of about 1 percent of the CO<sub>2</sub> emissions from a brown coal power plant.

In alkaline residues, such as steel slags or waste concrete, CaO and MgO are suspected to be the most important phases. In addition to the fly ash experiments we present first results of the CO<sub>2</sub> reaction with CaO and MgO in order to estimate the CO<sub>2</sub> binding potential of other feedstock materials and to get a more-detailed process understanding.

## References

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## Effusive and subeffusive rocks in the area of rare-metal ore fields of Phanerozoic and their petrogenetic significance

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Results of studying of composition and isotopic-geochemical data (Rb-Sr and Sm-Nd isotope systems) allow sharing out among effusive and subeffusive formations in the Transbaikalian region (Russia) three steady groups of rocks. These groups differ with time and place of separation of melt from uniform crustal source of magma: *ongonites* – surface F-rich extreme differentiations of granite magmas, on composition analogues of rare-metal granites; *rhyolites*, *ongorhyolites*, *felsite-porphyrries* of potassium specializations - result of separation of melt from homogeneous still not differentiated hypabyssal magmatic sources; *trachyrhyodacites* and *trachyrhyolites* - have the common substratum of melting with granites, however removal at earlier stage at formation from the magma source. First two groups of rocks close age among themselves and rare-metal granites while formation of trachyrhyodacites can fix appreciable break in time with them. The geochemical relationship of all set of these rocks consists in enrichment lithophile rare elements, in the similar character of distribution of display rare elements that confirms representation about the common substratum of melting. Distinction is shown in levels of concentration of these elements, specialization and contents of volatile components (F, Cl, B), degrees mantel-crust interactions. Studying of melt inclusions has shown the magmatic nature of high potassium concentration in trachyrhyolite melt, its primary geochemical specialization on lithophile elements and chlorine. Concentration of chlorine attain here limiting saturation for haplogranitic system - 0,34 wt. % Cl.