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## Lignite ash: waste material or potential resource - Investigation of metal recovery and utilization options

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**Abstract.** Ashes from lignite combustion for power generation contain strategic metals, metalloids and rare earth elements (REE) and may thus be a potential source of industrially demanded metals. The presented project focused on the assessment and utilization of this potential raw material. Lignite ash assessment showed that the largest ash amounts for a potential utilization in Germany are available in the Lusatia region and that these ashes have a high value potential. A stabilized ash taken from the landscape building “Spreyer Höhe”, Lusatia, served as the main sample. For enrichment, separation and mobilization of valuable substances from the lignite ashes mechanical and thermal pre-treatment methods as well as chemical and biological leaching approaches were applied. Mechanical ash pre-treatment provided enriched fractions by different methods but still suffered from low yields of enriched fractions. Thermal ash processing showed multiple significant phase changes compared to original ash. Digestion with sc-CO<sub>2</sub> and chemical leaching using HCl<sub>aq</sub> of untreated and thermally treated ash provided high extraction for the metals Al, Ca, Fe, Mg, with the highest values achieved for thermally treated ash. Alternatively, bioleaching was applied using acidophilic Fe/S-metabolizing microorganisms (MO) as well as heterotrophic MO. The results indicated likewise high and partly specific metal mobilizations, e.g. for the elements Al, Ca, Fe, Mg, Mn, V, Zn, Zr and for some REE. A potential utilization was investigated for the original stabilized ash (not treated otherwise) as well as for ash fractions and

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