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BGzEro – backfilling measures with low CO_2 footprint

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BGE TECHNOLOGY GmbH

BGzEro – Backfilling Measures with Low CO_2 Footprint

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I Introduction

In Germany, the Federal Company for Radioactive Waste Disposal (BGE) is responsible for the construction and operation of deep, geological repositories. In salt formations, BGE operates the ASSE II mine and Morsleben repository. These mines have large void volumes, and the stability of the unfilled cavities is limited in time so that backfilling measures are required for stabilisation.

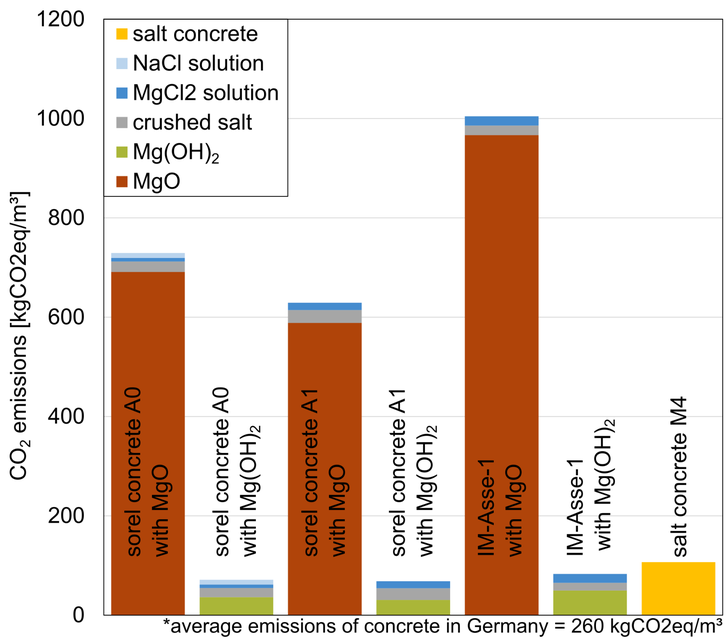
BGE aims at making its locations climate neutral. Backfilling measures are particularly affected by this effort because of the large material volumes required and the greenhouse gas emissions that are released during material transport and during the entire material production chain.

Bulk materials such as crushed rocks have a low CO_2 footprint, however, numerous cavities can only be backfilled with flowable, self-levelling, and self-hardening materials. Besides cement-based backfill materials, Magnesia binders play a major role in backfilling cavities. Most Magnesia binders contain the binder magnesium oxide (MgO). MgO is obtained by calcining magnesite ($MgCO_3$). However, a lot of energy is required for this process, and the CO_2 content of the magnesite is released.

II Solution Approaches

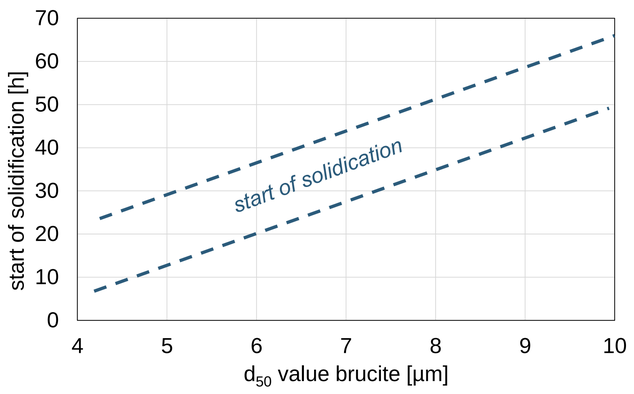
In order to realise the lowest possible CO_2 footprint, the current focus of work is on the development of magnesia binders with natural brucite, which is the mineral form of magnesium hydroxide ($Mg(OH)_2$).

Calculations show that the climate impact can be reduced to a fraction by substituting the MgO by $Mg(OH)_2$ and is even lower than that of salt concrete based on blast furnace cement.

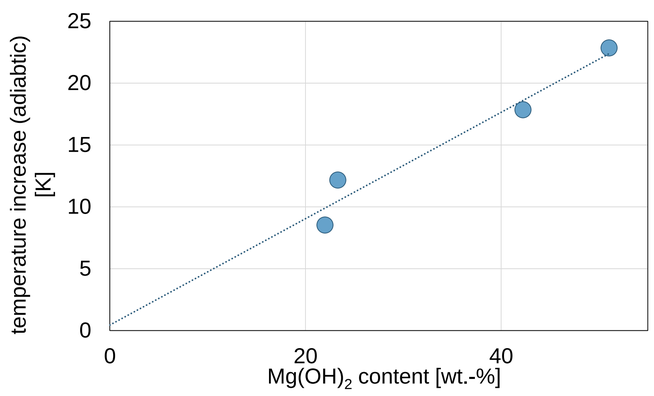


III First Results

- Easy to prepare, very long pot lives (mainly depending on grain size)



- Low heat development



- Very good flowability and self-levelling properties

Flow angle measurement of a Magnesia binder.

- Low bleeding

Experimental setup to determine the material bleeding.

- So far, compressive strengths of up to 45 MPa

More rheological and mechanical tests on different mixtures are in preparation to determine reference recipes for various applications.

The results show that BGE and BGE TECHNOLGY GmbH are on the way to developing Magnesia binders with a low climate impact and to achieving their self-imposed goals.