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Supplementary material

SUPPLEMENTARY MATERIAL TO

Room temperature zeolitization of boiler slag from a Bulgarian thermal power plant

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DETAILS ON ZEOLITIZATION EXPERIMENTS

Zeolitization experiments with the two fractions were performed employing a method similar to that reported by Derkowski *et al.*[1] and by Franus.[2] For this purpose, two sets of suspensions were prepared in polypropylene bottles by adding 10 g slag to 150 mL of 5 M water solution of technical grade NaOH (purity > 98 %). Then, the suspensions were stored at room temperature, and stirred and shaken a few times per week. For analyzing the solid reaction products, small samples were taken from the suspensions after different periods, namely after 144, 210, 255 and 410 days of alkali treatment. Prior to taking the aliquots, the samples were intensively stirred to ensure a homogeneous distribution of the solid products in the suspension.

The solid reaction products were separated by suction filtration. Thereafter, the filtered solid constituent of the samples was carefully washed with distilled water to neutral pH, dried at room temperature to a constant weight and kept in plastic bags for further characterization. The ratio $Y / \% = m_{\mathrm{pr}}\times 100/m_{\mathrm{sl}}$ was used as a measure for synthesis yield, where m_{pr} and m_{sl} were the masses of the reaction products and of the initial slag, respectively. It was introduced only for comparison purposes.

The thus-prepared samples were analyzed using different experimental techniques to obtain information about the elemental and phase compositions, the morphology and the yield of the reaction products. In the following, these samples will be designated by the capital letters "S" or "L" depending on whether the finer or the coarser slag fraction was used, followed by the time of alkali activation expressed in days. For example, the code name S410 means a sample obtained after 410 days alkali treatment of the slag fraction S.

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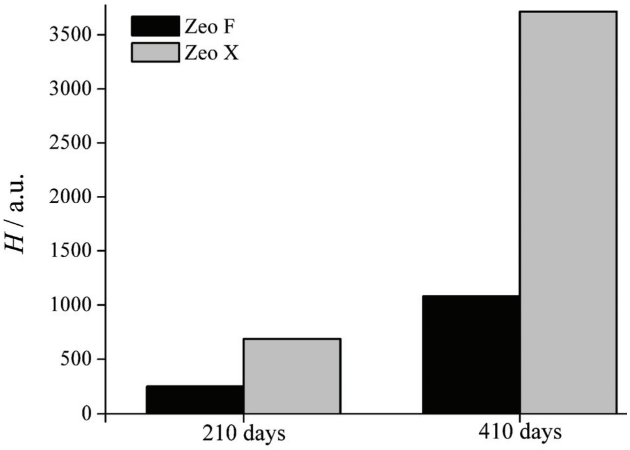
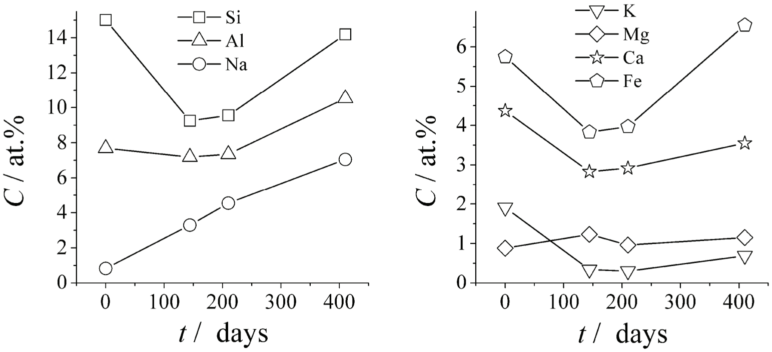


Fig. S-1. Comparison of the heights *H* of the most intensive peaks of the two identified zeolite phases, zeolite X and zeolite F, after 210 and 410 days of alkali treatment.



(a) (b)

Fig. S-2. Content *C* of Na, Al and Si (a) and K, Ca, Mg and Fe (b) in the reaction products as a function of the time *t* of alkali treatment of the finer S fraction.

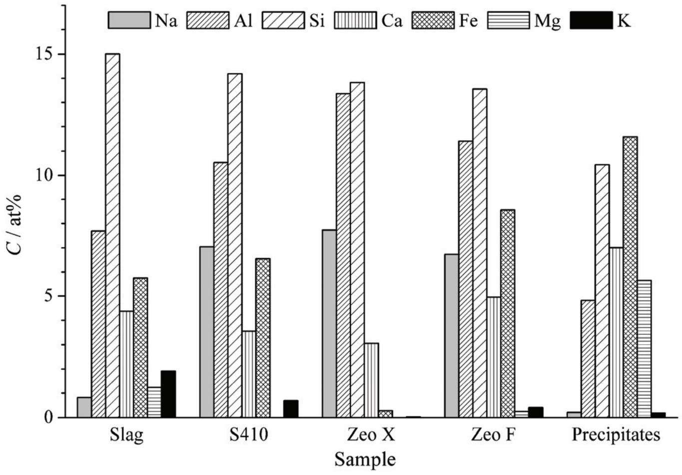


Fig. S-3. Elemental composition of the initial slag, the reaction products (sample S410), and of the crystallites of two zeolite phases X and F (Zeo X and Zeo F) formed after 410 days of alkali activation. For comparison, the respective data for the amorphous precipitates obtained after the same treatment time of the coarser fraction L are also presented.

REFERENCES

1. A. Derkowski, W. Franus, H. Waniak-Nowicka, A. Czimerova, *Int. J. Miner. Process.* **82** (2007) 57
2. W. Franus, *Pol. J. Environ. Stud.* **21** (2012) 337.