

XRD of natural and artificial Pozzolanes - Industrial residues and natural supplementary cementitious materials

Herbert Pöllmann, Sabrina Galluccio

University of Halle/Saale

Von Seckendorffplatz 3

06120 Halle/Germany

Email: herbert.poellmann@geo.uni-halle.de

CO₂-reduction during the fabrication process of cementitious materials plays a very important role, as tremendous amounts of carbon dioxide are produced during the decarbonation processes of limestone. For this reason many carbonate –free raw materials are used from raw material industry, processing industry and also from primary industries. These inorganic-based materials are composed of crystalline and amorphous components. To understand their reaction behaviour and the overall compositions different mixtures of pozzolanes (mine tailings, leaching products, slags, ashes, flue gas products, heat treated clays, volcanic and sedimentary rocks, recycling products) and cements are under investigation. All these differently and very complex mixtures must be characterized to ensure optimal quality of these cementitious mixtures. Other possibilities of producing different types of cement clinkers at elevated temperatures with different mineralogy must also be taken into account. For these mineralogical quantifications different determination methods were applied to quantify the different phases. A difference in hydration behaviour due to the chemical and mineralogical composition of the materials based on contents of crystalline and amorphous phases can be attributed and must therefore be determined.

For these complex mixtures several different methods will be applied like Rietveld analysis, Partial least squares regression (PLSR), cluster analysis and partial or not known crystal structures (PONKCS) and different examples demonstrated. A comparison of the results for amorphous contents obtained by Rietveld and PLSR is given in figure 1.

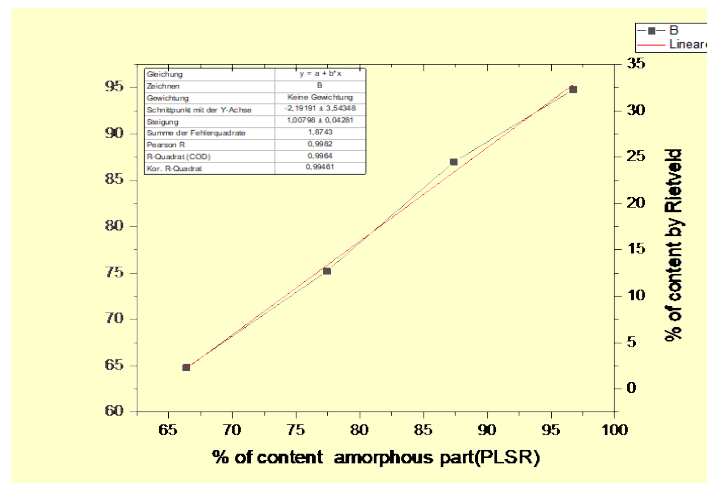


Fig.1: Determination of amorphous contents by PLSR and Rietveld analysis