the sample

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Issue 37 | Information from the field of solids preparation and characterization in laboratories and processing industries

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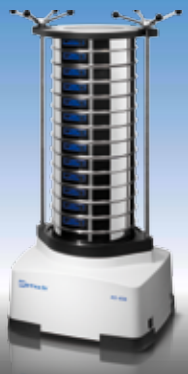

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Recycled glass – a valuable resource

Today, recycled glass is the most important resource for the glass industry. The processed glass can be reintroduced to the melting process any number of times and made into new products. In Germany, currently up to 95 % of recycled glass is used for producing glass, which has various advantages: energy saving, less consumption of primary raw materials (such as lime and silica sand) and the reduction of landfill costs for waste glass.

The glass which the consumer dumps in the waste container is collected and processed in modern recycling plants. The waste glass passes several stations such as opto-physical sorting machines and magnetic or eddy current separators which handle materials such as porcelain, ceramics, stones, metal, paper, plastics, off-colors, glass ceramic and lead glass, ensuring that the recycled glass is largely free of impurities and can be reintroduced to the production circle of the glass kilns.

Quality control of the recycled glass is of great importance as the remaining impurities in the glass may cause problems during or after the melting process. Extraneous materials such as stones or metal produce melting residues, so-called enclaves, in the glass which reduce the stability of the glass, and cause it to break more easily. Whereas most routine inspections in glass kilns or recycling plants are carried out without pretreatment of the sample and with a mere visual control of the impurities, the German Institute of Glass and Resource Technology (IGR) always **classifies the material with a RETSCH AS 450 control sieve shaker.** Thus it is possible to detect considerably larger concentrations of impurities which almost match the actual percentage in the processed recycled glass.

IGR – Institute for Glass and Resource Technology

The Institute for Glass and Resource Technology situated in Goettingen, Germany, is an independent service company whose core competence is focused on all subjects related to glass. The IGR is also involved in areas such as ceramics, refractories, construction materials and metals, as well as waste. Due to many years of experience in the fields of glass production and glass analysis the IGR has not only acquired profound expert knowledge but has also set up a proven system of quality control measures which comply with the requirements of the DIN EN ISO/IEC 17025.

www.igrgmbh.de

PERFORMANCE DATA

JAW CRUSHER BB 51

Applications:	Coarse and pre-crushing
Feed material:	medium-hard, hard, brittle, tough
Material feed size*:	< 35 mm
Final fineness*:	< 0.5 mm

SAMPLE DIVIDER PT 100

Applications:	Sample division and reduction
Feed material:	Bulk materials
Material feed size*:	≤ 10 mm
Feed capacity*	≤ 5,000 ml
Number of divisions:	6, 8 or 10

*depending on feed material and instrument configuration/settings

Managing Director Dirk Diederich and his colleagues

To evaluate the quality and application areas of the broken glass fragments, analysis of the chemical composition is crucial. Beside glass-specific elements such as silicium, natrium, calcium, magnesium and potassium, there are also heavy metals to be found such as lead, cadmium, mercury, arsenic and chromophoric elements such as iron, chrome, cobalt etc.. Usually, only very small sample volumes are used for routine analyses in the glass kilns and recycling plants, and the sample is not homogenized prior to examination. As a result, the analyzed element concentrations vary strongly. Moreover, some of the heavy metals and chromophoric elements are not detected at all in routine analyses.

A guide value for chemically processed recycled glass is, for example, a content of ≤ 350 ppm PbO. However, if by chance a single lead glass fragment (24 % PbO) with a weight of 6 g is contained in the total sample volume of 10 kg, the PbO concentration increases by 100 ppm. Consequently, analyzing this sample would result in a PbO content of 380 ppm instead of the original average concentration of, e.g., 280 ppm.

The most reliable method to obtain representative samples for chemical analyses is to reduce the sample in size, if required in two steps, and to divide it. To ensure the required statistical certainty and accuracy of the analysis results, a homogeneous sample volume of approx. 300 kg to 800 kg waste glass is required, depending on the element concentrations to be detected and the masses to be examined (for example a truck with a 25 t load or a batch with 3,000 t). The IGR divides the entire homogeneous sample quantity of a few 100 kg, crushes it in turn with the **RETSCH Jaw Crusher BB 200** (jaws and wearing plates of tungsten carbide) and the **Jaw Crusher BB 51** (jaws and wearing plates of zirconium oxide) and finally divides it representatively with **RETSCH's Sample Divider PT 100.** In a next step a homogeneous part sample of 40 g is ground either with the **Planetary Ball Mill PM 100** (agate grinding jar and balls) or with the **Mixer Mill MM 400** (zirconium oxide grinding jars and balls). Thanks to the variety of materials of the grinding tools offered by RETSCH, contamination-free grinding is ensured.

From this sample 0.3 g are taken, various acids are added and the sample is then thermally treated in special crucible, open or closed, and digested. After that the now water-soluble sample is acidified and filled into a volumetric flask. The sample of recycled glass is finally analyzed with an ICP-OES spectrometer for the concentrations of more than 30 elements.

Thanks to the preparation and analysis procedure developed and applied by the IGR, the rather small sample weight of 0.3 g represents with high statistical certainty the original sample volume of 25 t or 3,000 t respectively. This was successfully proved by various round robin tests and reference analyses.