



THIN GRINDING OF BUILDING MATERIALS

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/ CONTEXT

The determination of the mineralogical and chemical composition of building materials plays an important part in their quality control. Raw materials, intermediate products and finished products must all be analyzed to ensure quality standard of production and serve public health purposes. To be validated, samples must be taken and reduced into a fine powder before being submitted to further analysis such as XRF or other elemental analysis techniques. In order to perform a reproducible XRF analysis, the sample must meet material-dependent criteria for thinness. This thinness limits the absorption of X-rays in the sample and is therefore a crucial parameter to obtain accurate results. For example cement requires a thinness of at least 10 microns to detect elements of smaller atomic numbers such as Aluminum.

In this application note, we use Precellys Evolution homogenizers and its metal tubes to grind samples of cement or floor tiles and obtain powder thinness from the micrometer scope.

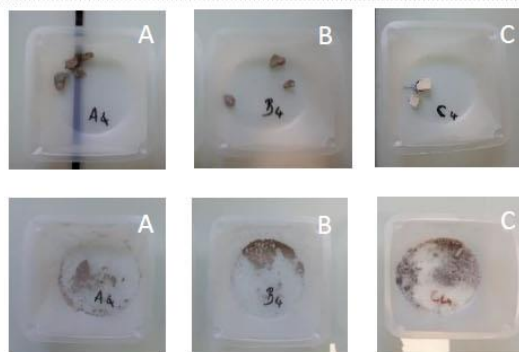
/ MATERIALS

- Bead beating Homogenizer: Precellys Evolution (Bertin Technologies, France), Cryolys Evolution cooling module (Bertin Technologies, France)
- Lysing kits: 7mL metal tubes (P000952-LYSK0-A.0), 7mL metal tubes holder (S000813-PEVO0-A.0), 20 x 2.8mm stainless steel beads (P000925-LYSK0-A.0), 3x 4.00mm stainless steel beads
- InCellis Cell imager (Bertin Technologies, France)
- Material samples: 1 asbestos-free cement block, 1 asbestos-containing cement block, 1 floor tile

/ PROTOCOL

1. Samples were pre-crushed with hammer into smaller, 1-4 cm² sized pieces
2. 1g of each sample was loaded in 7mL metal tubes with twenty 2.8mm stainless steel beads and three 4.00 stainless steel beads
3. The tubes were placed in Precellys Evolution homogenizer with blocking plate, and set grinding protocols to 8,500 RPM for 3 cycles of 30 sec with 5 sec pause, Cryolys ON at 4°C

/ RESULTS



A. Asbestos-free | B. Asbestos-containing cement block sample.
C. Floor tile sample
Top: Before homogenization
Bottom: After homogenization with Precellys Evolution

The resulting powders grains were measured, and found to have sizes between 0.5 μ m and 4 μ m, making them compatible with XRF analysis.

/ NOTE

The metal tubes were washed with the following protocol:

- a) Fill the tubes with ethanol
- b) Place the tubes in Precellys with the program: to 8,500 RPM for 5 cycles of 30 sec with 5 sec pause, Cryolys ON at 4°C

/ CONCLUSION

The Precellys Evolution homogenizer combined with the metal tubes is the ideal tool to quickly and reproducibly grind hard samples, such as building materials. As thinness reaches lower levels than 4 μ m, the powders obtained are compatible with XRF elemental analysis. 1 to 6 samples (1g/7mL tube) can be homogenized at the same time.

Precellys Evolution is a versatile and efficient high-throughput homogenizer for labs performing quality control of building materials.



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