

ULTRASONIC MICRO-GRINDING

Ultrasonic micro-grinding is a viable alternative or adjunct to planetary and centrifugal ball milling in the application of particle size reduction, when processing superfine ceramic, alumina, and metal oxide slurries.

Equipment of choice for this application is, depending on the volume, either the Sonics & Materials Vibra-Cell™ 750 watt or Vibra-Cell™ 1500 watt, 20 kHz ultrasonic processor and high-volume continuous flow-cell. The HV flow-cell is manufactured of sanitary grade, 316 stainless steel and is easily disassembled for cleaning. An integrated water-jacket, through which cold water can be circulated, enables the sample to remain cool while it is being processed.

The principle of ultrasonic micro-grinding is based on the high shear energy produced by cavitation. The ultrasonic probe's longitudinal vibrations are transmitted into the slurry as alternating high and low pressure ultrasonic waves. The pressure fluctuations pull the liquid molecules apart creating millions of micro-bubbles (cavities), which expand during the low pressure phase and implode violently during the high pressure phase. As the bubbles collapse, shock waves, micro jets, eddies and extremes in pressures and temperatures are generated at the implosion sites. Although this phenomenon, known as cavitation, lasts but a few microseconds and the amount of energy released by each individual bubble is minimal, the cumulative amount of energy generated is extremely high and most effective in wet-milling applications, thus reducing the particle's size to colloidal fineness, (1 micron and below).

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