High-energy ball mills for nano-scale grinding

Retsch, Haan, Germany, points out that there are essentially two methods of producing nano-scale particles: the 'bottom-up' technique involves synthesising the particles from atoms and molecules; or the 'top-down' method, whereby particles are reduced to nanometer size by grinding. A suitable tool for this latter method is a planetary ball mill, such as the company's PM 100, PM 200 or PM 400, which provides the necessary energy input.

Retsch PM Series planetary ball mills

With decreasing particle size, electrostatic and even molecular interactions increase, leading to particle agglomerations which cannot be reduced any further in size. For this reason, the grinding process has to be carried out in a liquid medium (colloidal grinding) which disperses the particles as much as possible.

For nano-grinding in a ball mill, the grinding jar and balls have to be of a very abrasion-resistant material, such as zirconium oxide, to minimise contamination of the sample material by abrasion. Factors such as the choice of dispersion medium or grinding ball size have a crucial influence on the success of the process. Generally, small ball diameters < Ø 3mm and grinding times of several hours are beneficial for the production of nano-particles, as substantially more energy and a greater surface are required than for dry grinding in the micron range. www.retsch.com