8000M MIXER/MILL

Mechanical Alloying with the SPEX SamplePrep Mixer/Mill

SPEX SamplePrep 8000-series Mixer/Mills have been used for pulverizing rocks, minerals, sand, cement, slag, ceramics, catalyst supports, and hundreds of other brittle, often hard samples. Early on, the 8000 was used to grind samples, then blend them with graphite for arc/spark spectroscopy; now similar samples are ground, then blended with binder before being pressed into sample discs for XRF. The vigorous motion of the clamp is also excellent for making emulsions, such as paints, inks and pharmaceuticals. 8000M Mixer/Mills have also achieved notoriety for their ability to mechanically alloy small quantities of superconductor materials.

Mechanical alloying, also referred to as reactive milling, is a process originally developed for the production of oxide dispersion strengthened superalloys. Today, mechanical alloying is often used as a solid-state powder processing technique that generates powders with unique microstructures. A high-energy ball mill can be used to accomplish this. Over the past few decades, the SPEX SamplePrep Mixer/Mill, widely known as the “SPEX Mill”, has become the industry standard for mechanical alloying applications. The high energy of the milling action, and the durability of the motor, allow running for extended periods.

Over the years, nearly one hundred articles have been published in refereed scientific journals regarding the SPEX SamplePrep Mixer/Mill and it’s use for mechanical alloying. This includes mechanical alloying techniques, evaluations of grinding vial materials, and numerous other topics. The following publication list is intended to highlight the more recent publications that we are aware of and is not intended to be comprehensive. If you are considering the Mixer/Mill for your own mechanical alloying application, we strongly encourage you to do your own search for application publications and references.

The SPEX SamplePrep 8000M Mixer/Mill is equipped with a timer that is factory set for a 100-minute time range. However, mechanical alloying requires significantly longer grinding times. For these applications, we offer an optional chip (Cat. No. 39450) to extend the timer range to 1,000 or 10,000 minutes. This chip is available as either a factory-installed or user-installed option. Due to extreme wear that can occur on the Mixer/Mill from extended running times, installation of this chip will change the warranty terms. Additionally, in order to prevent the mill from breaking down prematurely, a routine schedule of preventative maintenance is strongly suggested. For additional information please contact SPEX SamplePrep Customer Service.

SPEX SamplePrep LLC
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8000M MIXER/MILL

Select Publications Pertaining to Mechanical Alloying

Effect of the heating rate on crystallization behavior of mechanically alloyed $Mg_{50}Ni_{50}$ amorphous alloy. Aydinbeyli, N., Nuri Celik, O., Gasan, H., Aybar, K. *International Journal of Hydrogen Energy*, Vol. 31, Issue: 15, December, 2006. pp. 2266-2273.

Effect of ball milling on simultaneous spark plasma synthesis and densification of TiC-TiB2 composites. Locci, A.M., Orru, R., Cao, G., Munir, Z.A. *Materials Science and Engineering A*, Vol. 434, Issue: 1-2, October 25, 2006. pp. 23-29.

Temperature of the milling balls in shaker and planetary mills. Takacs, L., McHenry, J. S. *Journal of Materials Science*, Vol. 41, Issue: 16, August 2006. pp. 5246 – 5249.

Modeling of comminution processes in Spex Mixer/Mill. Concas, A., Lai, N., Pisu, M., Cao, G. *Chemical Engineering Science*, Vol. 61, Issue: 11, June, 2006. pp. 3746-3760.

Effect of mechanical alloying conditions on the microstructure evolution and electrode characteristics of $Mg_{63}Ni_{30}Y_7$. Khorkounov, B., Gebert, A., Mickel, Ch., Schultz, L. *Journal of Alloys and Compounds*, Vol. 416, Issue: 1-2, June 8, 2006. pp. 110-119.

A study of mechanical alloying processes using reactive milling and discrete element modeling. Ward, T.S., Chen, W., Schoenitz, M., Dave, R.N., Dreizin, E.L. *Acta Materialia*, Vol. 53, Issue: 10, June, 2005. pp. 2909-2918.

Microstructural evolution during mechanical alloying of Mg and Ni. Rojas, P., Ordonez, S., Serafini, D., Zuniga, A., Lavernia, E. *Journal of Alloys and Compounds*, Vol. 391, Issue: 1-2, April 5, 2005. pp. 267-276.

Mechanical milling of magnesium powder. Hwang, S., Nishimura, C., McCormick, P.G. *Materials Science and Engineering: A*, Vol. 318, Issue: 1-2, November, 2001. pp. 22 – 33.

Formation of supersaturated solid solutions by mechanical alloying. Huang, B.-L., Perez, R.J., Lavernia, E.J., Luton, M.J. *Nanostructured Materials*, Vol. 7, Issue: 1-2, January 2, 1996. pp. 67-79.

Synthesis of nanocrystalline Fe-B-Si powders. Perez, R.J., Huang, B.-L., Crawford, P.J., Sharif, A.A., Lavernia, E.J. *Nanostructured Materials*, Vol. 7, Issue: 1-2, January 2, 1996. pp. 47-56.

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