

## **Modification of parameters in mechanochemical synthesis to obtain $\alpha$ - and $\beta$ -molybdenum disilicide.**

### **Abstract**

In this paper, molybdenum disilicide  $\alpha$ - and  $\beta$ -phases can be successfully synthesized during mechanical alloying (MA). Also, this method promote a self-propagating reaction (MSR) at balls to powder ratio (BPR) 10:1, shorter milling time with speed (400 rpm) without subsequent heat treatment that was considerably lower energy than that used in conventional methods. Two different molar ratios of Mo:3Si and Mo:4Si were prepared in addition to the stoichiometric powder mixture Mo:2Si intermittent sampling was done from 4 h to 20 h. Increasing Si content clearly delayed the MSR and the reactants were gradually converted to both  $\alpha$ - and  $\beta$ -MoSi<sub>2</sub> phases over a relatively long time. Samples were characterized by using X-ray diffraction (XRD)/scanning electron microscopy (SEM) analyses and grain size calculated based on the conventional Scherrer method. XRD patterns of stoichiometric powder samples milled with BPR 10:1 indicated the rapid formation of  $\alpha$ - and  $\beta$ -MoSi<sub>2</sub> even after 4 h milling. Samples milled with higher BPR lost their crystallinity after milling for 16 h. SEM images in general showed considerable lowering in average particle size with milled samples. Crystallite size was found to decrease with milling time and with increasing BPR.

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