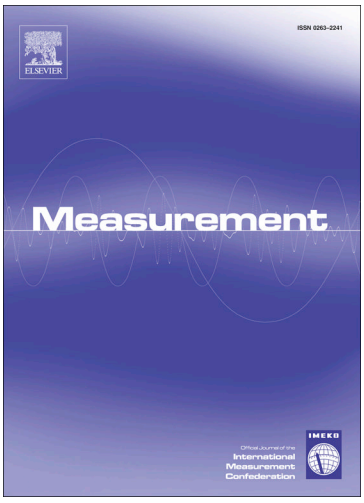

Study on particle size and x-ray peak area ratios in high energy ball milling and optimization of the milling parameters using response surface method

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PII: S0263-2241(17)30519-5
DOI: http://dx.doi.org/10.1016/j.measurement.2017.08.021
Reference: MEASUR 4919

To appear in: *Measurement*

Received Date: 1 March 2017
Revised Date: 31 July 2017
Accepted Date: 11 August 2017

Please cite this article as: F. Erdemir, Study on particle size and x-ray peak area ratios in high energy ball milling and optimization of the milling parameters using response surface method, *Measurement* (2017), doi: http://dx.doi.org/10.1016/j.measurement.2017.08.021

Study on particle size and x-ray peak area ratios in high energy ball milling and optimization of the milling parameters using response surface method

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Abstract

In this work, micro and nano B_4C powders were prepared by high energy ball milling. The effects of milling parameters on particle size and x- ray peak ratios were investigated using response surface methodology (i.e. central composite design). Central composite design was implemented to determine the effects of milling parameters (milling time, ball to powder ratio and milling speed) on the response (i.e. particle size and x- ray peak ratios). The adequacy of the mathematical models established and the significance of the regression coefficients (i.e. linear, quadratic and interaction effects of the parameters) were analyzed using the analysis of variance (ANOVA). A scanning electron microscopy (SEM), x-ray diffraction (XRD) and laser particle size analyzer were used for characterization of micro and nano B_4C powders. It was clearly noticed that the milling speed and milling time were the most influential parameters to minimize particle size (d_{50}) and x- ray peak ratios. Minimum average particle size of 700 nm was achieve at a milling speed of 300 rpm and ball-to-powder ratio (BPR) of 15:1 while minimum x-ray peak area ratio of 0.080 was obtained at a milling speed of 300 rpm and BPR of 15:1.

Keywords: Particle size, amorphous, high energy ball milling, response surface methodology.