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PII: S0263-4368(16)30607-2
DOI: doi: 10.1016/j.ijrmhm.2017.02.002
Reference: RMHM 4413

To appear in: *International Journal of Refractory Metals and Hard Materials*

Received date: 7 October 2016
Revised date: 6 February 2017
Accepted date: 13 February 2017

Please cite this article as: He Zhang, Shangsheng Li, Guanghui Li, Taichao Su, Meihua Hu, Hongan Ma, Xiaopeng Jia, Yong Li , Effect of B-S co-doping on large diamonds synthesis under high pressure and high temperature. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Rmhm(2017), doi: 10.1016/j.ijrmhm.2017.02.002

Effect of B-S co-doping on large diamonds synthesis under high pressure and high temperature

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Abstract: Large single-crystal diamonds with *n*-type semiconductor were synthesized from S/B-S co-doping FeNiCo-C system under high pressure and high temperature (HPHT) in this paper. It was found that the slight variation of the additive S content had not made obvious change for the color of diamonds synthesized from FeNiCo-C system. The B-S co-doping samples became more transparent and yellow than the samples added alone by S. The analysis of X-ray photoelectron spectroscopy (XPS) spectra and Fourier transform infrared (FTIR) spectroscopy showed the presence of B and S in the obtained diamonds. The electrical properties of large diamond crystals were tested by Van der Pauw method with a four-point probe. The highest value of the hall mobility was 628.726 cm^2/vs. And the lowest value of the resistivity was 9.33×10^5Ω•cm with boron additive of 0.8 wt.% and sulfur of 2 wt.% doping to diamond which was confirmed as n-type. This work indicated that B-S co-doping to synthesize diamond crystals was a trend to promote the electrical properties of large diamond crystals.

Keywords: large single-crystal diamond, HPHT, B-S co-doping, electrical property