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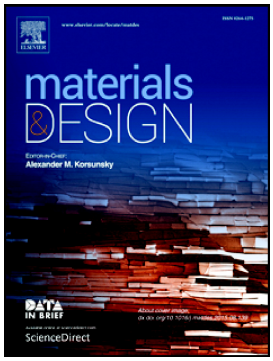

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K.N. Zhu, A. Godfrey, N. Hansen, X.D. Zhang

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Microstructure and mechanical strength of near- and sub-micrometre grain size copper prepared by spark plasma sintering

K.N. Zhu[1], A. Godfrey[1], N. Hansen[2], X.D. Zhang[2]

1. Key Laboratory of Advanced Materials (MOE), School of Materials Science and Engineering, Tsinghua University, Beijing 100084, China.

2. Section for Materials Science and Advanced Characterization, Department of Wind Energy, Technical University of Denmark, Risø Campus, 4000 Roskilde, Denmark.

Keywords: spark plasma sintering; copper; ultra-fine grain size; mechanical properties.

Abstract

Spark plasma sintering (SPS) has been used to prepare fully dense samples of copper in a fully recrystallized condition with grain sizes in the near- and sub-micrometre regime. Two synthesis routes have been investigated to achieve grain size control: (i) SPS at different temperatures from 800 to 1000 °C, and (ii) SPS at 800 °C followed by annealing at temperatures from 950 to 1050 °C. By use of an initial spherical powder with an average particle diameter of ≈ 0.5 μm, samples with average grain sizes in the range from 0.5 to 3 μm have been prepared. Microstructural examination based on both transmission electron microscope, and on electron back-scatter diffraction studies, confirms the samples are in a