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Data Article

Data on the influence of cold isostatic pre-compaction on mechanical properties of polycrystalline nickel sintered using Spark Plasma Sintering

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ABSTRACT

Data regarding bulk polycrystalline nickel samples obtained by powder metallurgy using Spark Plasma Sintering (SPS) are presented, with a special emphasis on the influence of a cold isostatic pre-compaction on the resulting morphologies and subsequent mechanical properties. Three types of initial powders are used, nanometric powders, micrometric powders and a mixture of the formers. For each type of powder, the SPS cycle has been optimized for the powders without pre-compaction and the same cycle has been used to also sinter pre-compacted powders.

Specifications Table

Subject area	*Physics*
More specific subject area	*Powder metallurgy*
Type of data	*Images, Figures*
How data was acquired	*SEM (Carl Zeiss Supra 40 VP-FEG), EBSD (TexSEM OIM 5 Software), compression tests (Deben™ Microtesting machine).*

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Data format	*Analyzed*
Experimental factors	*Commercial powders of different grain sizes, nanometric and micrometric, or a mixture of them were sintered using Spark Plasma Sintering (SPS), either directly from loose powders or after a Cold Isostatic Pressing (CIP) step.*
Experimental features	*After polishing, samples were observed by SEM and EBSD, and compression tests were performed to determine mechanical characteristics of processed bulk materials.*
Data source location	*Laboratoire des Sciences des Procédés et des Matériaux, UPR 3407, 99 avenue Jean-Baptiste Clément, 93430 Villetaneuse, France.*
Data accessibility	*Data is with this article*

Value of the data

- The data describe the influence of a pre-compaction step on the final microstructure after SPS.
- The data presents the influence of the nature of the initial powders.
- The data provides information on the influence of these microstructures on the resulting mechanical properties.
- Pre-compaction by CIP followed by SPS procedure can serve as a mean for Σ3 grain boundaries engineering.
- Data shows that presence of Σ3 grain boundaries allows for a good compromise between compressive stress and strain to failure.

1. Data

Nanometric, micrometric and a 40% nanometric – 60% micrometric mixture of powders have been sintered using SPS, with an optional pre-compaction of the powders using Cold Isostatic Pressing. Density measurements are provided and EBSD investigations of the samples are presented. From these EBSD data, texture analysis has been performed, grain sizes determined and information on specific grains boundaries, namely Low-Angle Grain boundaries (LAGBs) and Σ3 grain boundaries data is provided. The mechanical behavior under compression tests of the processed samples is presented.

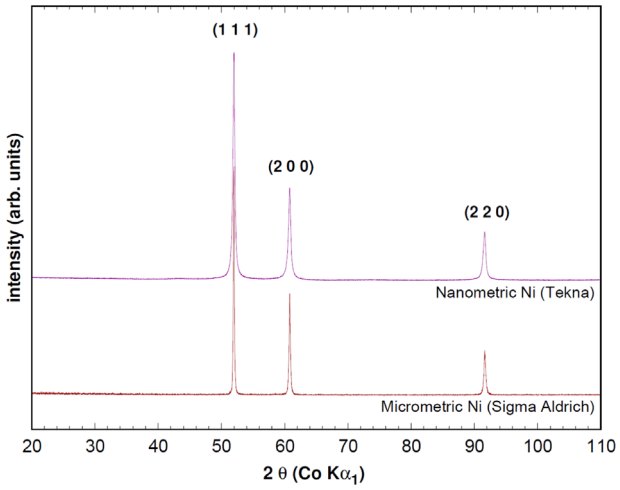

Fig. 1. XRD patterns of the two types of powder used, showing the sole presence of Nickel.