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MULTI SCALE MODELING OF Nb-Al MICROCOMPOSITE USING A COMMERCIAL FINITE ELEMENT SOFTWARE

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The worldwide requirements for reducing the energy consumption and pollution have increased the demand of new and high performance lightweight materials. The progress in manufacturing technologies gives the opportunity of exploring new type of composites. Metal-metal composites are manufactured by means of plastic deformation processes. In particular, the use of Nb as reinforcement particle in Al alloy matrix composites was experimentally tested by few authors using severe plastic deformation processes [1,2].

With the aim of producing high strength metal-metal composites in flat shape, in the present work the deformation of a Nb particle embedded in a pure Al matrix under multiple rolling steps is analysed. Prior to rolling it is assumed the Nb particles as spheres with 100 μm of diameter.

The multiscale analysis was performed within the framework of commercial finite element software. Figures 1 summarizes the selected approach. The effects of the simplifying assumptions adopted to circumvent the limitations derived from the selected approach are discussed in detail.

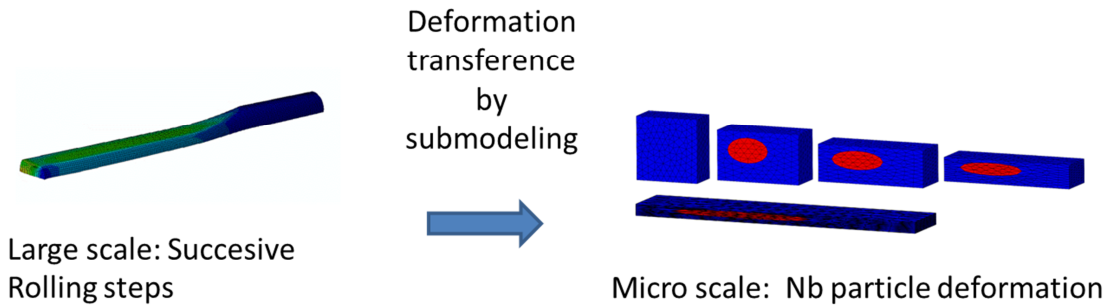

Figure 1. Summary of the selected approach for the multiscale analysis.

Information of physical and mechanical properties of the pure aluminium and the Al-Nb composite manufactured by powder metallurgy techniques have been taken from a recent experimental work [3].

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