

# SYNTHESIS OF NICKEL BASED SUPERALLOY FOR HIGH TEMPERATURE APPLICATIONS

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## ABSTRACT

There has always an increasing demand for producing suitable materials for high temperature applications especially in the field of power generation, nuclear, aerospace and defense sectors. Nickel base Oxide Dispersion Strengthened alloys are being made by only a few producers in the world. The present study was taken up to synthesize Ni based superalloy with yttria dispersion strengthened alloys by MA. Oxides can make best dispersoids because of its high hardness, stability at high temperatures, inertness, or insolubility in the matrix. These oxide particles were incorporated into the metal by planetary ball mill. The volume fraction of the dispersoid added was 0.6 wt%. Synthesis of nanocrystalline yttria used as dispersoid was prepared by Sol-gel method. MA makes possible the combination of dispersion, solid solution and precipitation strengthening by mixing all the constituents in the powder more intimately and to form a true alloy powder with oxides dispersed in the solid solution. Characterization of ODS alloy powders was taken up after experimental synthesis. XRD analysis was carried out. SEM Analysis of the ODS alloy powders were recorded to evaluate the micro structural evolution during MA. Energy Dispersive Analysis of the X-rays of the alloy powder was carried out to study the alloying of the elemental powder. The MA powders were compacted and densified by SPS & observed to confirm the presence of yttria and determine the particle size. The microhardness values of the sintered compact shows that high hardness can be achieved by SPS technique compared to other conventional sintering processes.

**Keywords:** Nickel based superalloy, Oxide dispersion strengthening (ODS), Mechanical alloying

\*MA: Mechanical Alloying, \*SPS: Spark Plasma sintering, \*XRD: X-Ray Diffraction, \*SEM: Scanning Electron Microscopy, \*ODS: Oxide Dispersed Sintering

