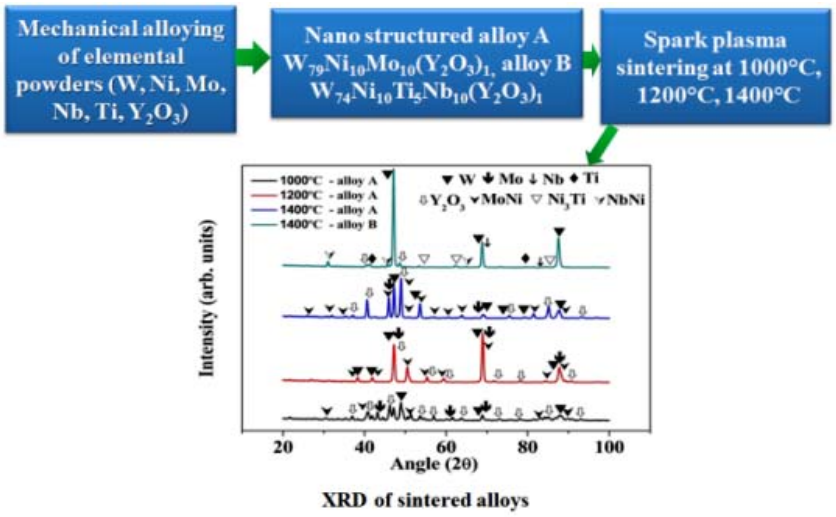
Fabrication and characterization of nano-Y_2O_3 dispersed W-Ni-Mo and W-Ni-Ti-Nb alloys by mechanical alloying and spark plasma sintering, A. Patra, R. Saxena, S.K. Karak, T. Laha, S.K. Sahoo, Metallurgical and Materials Engineering Department

In the present investigation, nano-Y_2O_3 dispersed W-Ni-Mo and W-Ni-Ti-Nb alloys with nominal composition of $W_{79}Ni_{10}Mo_{10}(Y_2O_3)_1$ (alloy A) and $W_{74}Ni_{10}Ti_5Nb_{10}(Y_2O_3)_1$ (alloy B) (all in wt.%) were synthesized by mechanical alloying (MA) for 20 h followed by spark plasma sintering (SPS) at 1000°C, 1200°C and 1400°C for alloy A and at 1400°C for alloy B, respectively for 5 min at 75 MPa pressure. Higher reduction of crystallite size and increase in lattice strain in alloy B is attributed to increased brittleness caused by Ti addition. Texture intensity and residual stress increases and decreases respectively with increase in SPS temperature. However, alloy B had a higher residual stress compared to alloy A, both sintered at 1400°C. The sinterability, hardness, compressive strength and wear resistance increased with increase in SPS temperature for alloy A. Alloy B sintered at 1400°C achieved maximum hardness (11.89 GPa), compressive strength (2.26 GPa) and wear resistance (wear rate: 1.14×10^{-6} mm^3/N m). Reduction in grain growth by rapid spark plasma sintering cycle results in substantial improvement in strength, hardness with appreciable ductility as compared to conventionally sintered W-Y_2O_3 alloys. **More in Journal of alloys and Compounds. DOI: 10.1016/j.jallcom.2016.11.424**



XRD of sintered alloys