
Abstract

The aim of the present study is to prepare NiTi alloys as references alloy and NiTi alloys with different additives of Ta and Nb individually, then, do a comparison between the characteristics of each group. The purpose of experimenting the physical characteristics and transformation temperatures of alloys is to elect the better percentage of additives for different applications.

Powder technology technique is used to prepare the samples; the temperature of sintering was 950 °C at time 9 hr. The prepared samples were Master sample M_1 55 wt% Ni-45 wt% Ti and master sample M_2 56 wt% Ni-44 wt% Ti. The additive of Ta was 5%, 7% and 9% to master sample M_1 and M_2 , while Nb addition was 1%, 2% and 4% to M_1 and M_2 . The pressure used was 800 MPa. After samples preparation, they have been examined by using SEM technique, XRD, DSC, Vickers hardness and Archimedes method in measuring the porosity percentage.

Scanning electron microscopy analysis determines that most prepared samples have porosity, which in turn imparts decreasing microhardness values across the surface. Better increase of microhardness values is found in T2 ($M_2+5\%Ta$). Scanning electron observations indicated also the best martensitic structure in N5 ($M_1+4\% Nb$) and N6 ($M_2+4\%Nb$). X-ray diffraction observations indicated that NiTi phases, Ni_3Ti phases and $NiTi_2$ phases exist in all samples. NiTi phase plays a dramatic role in enhancing shape

memory effect and superelasticity. DSC results show that transformation temperatures range is in 46-134°C; this indicates that all samples at room temperature (~30 °C) have one phase which is martensite. Hardness and Porosity results show that M_2 has more hardness and less porosity than M_1 , and addition of Ta and Nb mostly lead to increase in porosity and decrease in hardness.