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# Effect of the Thermal Treatments in the Mechanical Behavior of the Ni-Ti wire with Shape Memory Effect

Euclides Apolinário Cabral de Pina[(1)*], Cezar Henrique Gonzalez[(1)], Carlos Augusto do Nascimento Oliveira[(1)], Severino Leopoldino Urtiga Filho[(1)], Oscar Olimpio de Araujo Filho[(1)*] and Carlos José de Araújo[(2)]

(1) Universidade Federal de Pernambuco – Centro de Tecnologia e Geociências – Departamento de Engenharia Mecânica, Av. Acadêmico Hélio Ramos, s/n, Cidade Universitária, 50740-530, Recife – PE, e-mail: kikipina@hotmail.com.
(2) Universidade Federal de Campina Grande, Departamento de Engenharia Mecânica, Av. Aprígio Veloso, 882, Caixa Postal: 10069, Campina Grande - PB, CEP 58109-970, Brasil.
* Corresponding author.

**Abstract –** The shape memory alloys are used as actuators in mechanical engineering, medical area, aerospace, because of their natural behavior known as shape memory alloys (SMA). The SMA is known to be from the thermo-elastic martensitic transformation. The nature of transformation is heavily dependent of the history thermo-mechanical alloy. The thermo-mechanical alloy's answer with shape memory alloys suffers substantial changes with variations in the chemical, metallurgical processing and thermo-mechanical cycling. Small changes in the chemical bond composition are known to provide significant changes in temperatures of transformation. In the case of Ti-Ni alloy, they are well known by its shape memory effect and super-elastic behavior. The SMA and SE were extensively investigated in the last decades along with the ductility, resistance to fatigue and high damping capacity because of its potential used in various applications in several industrial areas. The practical application of shape memory alloys effect is directly related to its temperature transformation stage. The temperature transformation of the Ti-Ni alloy can be adjusted entirely to a appropriate heat treatment. With different thermal treatments above the cooling, the Ni-Ti alloy exhibits also a martensitic transformation from B2 to the phase B19 ', or two stages of martensitic transformation from B2 to the phase R, then to the phase B19.

This work aims to analyze the behavior of the NiTi alloy with 1,27 mm of diameter with composition close to *equiatomic* under several times of aging. This work aims to accomplish an analysis of the Mechanical behavior of TiNi base alloys with shape memory effect. These alloys are TiNi wires with different diameters. The mechanical behavior will be analyzed by x-ray diffraction, SEM and EDS. The used wires are commercial and had been submitted to different thermal treatments in order to study the thermo-mechanical process and its influences in the thermo elastics properties of the shape memory effect. The wire samples had been cut in pieces, weighed and submitted to the thermal treatment at 400°C quenched in water at 25°C. The wires were submitted to thermal treatments during: 1, 2, 4, 8, 16 and 24 hours. After this procedure, the samples had been tested in a differential scanning calorimeter (DSC), with the following parameters of scanning: two thermal cycles in the interval of temperature between - 40°C and 110°C. The temperatures of phase transformation, hysteresis and enthalpies of transformation, as well as the influences of the re-crystallization in these properties will be analyzed.

## References

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