B04

고온자전합성 연소파 전파 거동이 TiNi 형상기억합금 다공체 기공 형성에 미치는 영향

Effect of Combustion-Wave Propagation Behavior during SHS Process on Pore Formation of TiNi Porous Body

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Self-propagating High-temperature Synthesis (SHS) method was used for the production of porous TiNi body. Starting powder shape, size and its distribution, ignition temperature, and heating schedule were varied to investigate a relationship between the processing variables, microstructure and property. Porosity, pore size and microstructure of porous product were determined by image analyzer. Phase analysis was carried out by XRD. Various mechanical tests were performed for investigation on compressive strength, torsion strength and fatigue property. Biological investigations were also performed to confirm the biocompatibility.

Particle shape, size and its distribution of starting powder affected significantly the SHS reaction behavior. The minimum ignition temperature for a stable propagation of combustion wave changed depending on the mixing combination of Ti and Ni starting powder. Phases formed in the reaction product were TiNi as a major phase and Ti_2Ni and $TiNi_3$ as minor ones. The fraction of TiNi phase increased with an increase in the ignition temperature and by the acid treatment for the reaction product. Ms temperature determined by DSC was approximately 65°C. Pore size and structure could be controlled through a change of heating schedule prior to ignition. Relationship between the behavior of combustion wave propagation, pore structure and mechanical property were discussed. Results of bone tissue response and biocompatibility tests were also given.