高线性超弹性多孔NiTi合金的压缩力学行为

张宇鹏[1, 2]，赵四勇[2]，马　骁[1]，张新平[1]

(1. 华南理工大学 材料科学与工程学院，广州 510640；
2. 广州有色金属研究院 焊接材料研究所，广州 510651)

摘　　要：　采用造孔技术结合粉末冶金烧结工艺制备多孔NiTi合金，并利用精密万能力学性能试验机对孔隙率为22.4%~60.6%的多孔NiTi合金样品进行循环压缩实验，以表征其压缩力学性能及超弹性。结果表明：所制备的合金经若干个应力—应变循环"训练"后其输入、输出能量可达平衡，应变水平高达4%，线性超弹性可靠，弹性模量稳定；循环加载条件下，残余应变量随孔隙率的增加而增大，但随循环数的增加而减小；残余变形与其影响因素之间可用双曲线函数关系描述。

关键字：　多孔NiTi合金；超弹性；残余应变；弹性模量

Compression mechanical behavior of porous NiTi alloys exhibiting high linear superelasticity

ZHANG Yu-peng[1, 2], ZHAO Si-yong[2], MA Xiao[1], ZHANG Xin-ping[1]

（1. School of Materials Science and Engineering, South China University of Technology, Guangzhou 510640, China;
2. Group of Welding and Soldering Technologies, Guangzhou Research Institute of Non-ferrous Metals, Guangzhou 510651, China）

Abstract: Porous NiTi alloys were fabricated by pore-forming technique and powder metallurgy sintering process, the compressive mechanical properties and superelasticity of the porous NiTi alloys with porosity ranging in 22.4%−60.6% were characterized by cyclic compression test using a versatile mechanical testing machine. The results show that the *energy input* balances against the energy *output* during cyclic loading of the porous NiTi alloy after performing several compression cycles as 'training', and the porous NiTi alloys exhibit reliable lineaing superelasticity and stable elastic modulus, with strain as high as 4%. The residual strain (ε_r) increases with increasing porosity whereas decreases with increasing number of compression cycles. The correlation between ε_r and other influential factors largely follows a *hyperbolic trend*.

Key words: porous NiTi alloys; superelasticity; residual strain; elastic modulus