Impact of plastic deformation on the boson heat capacity peak of metallic glass

Yu.P. Mitrofanov,1,2, a) M. Peterlechner,1 S.V. Divinski,1 and G. Wilde1

1 Institute of Materials Physics, University of Münster, 10 Wilhelm-Klemm Str., Münster 48149, Germany
2 Department of Solid State Physics, State Technical University, 14 Moscow Ave., Voronezh 394026, Russia

Abstract

Low-temperature heat capacity measurements are performed on bulk Pd40Ni40P20 in as-quenched glassy, deformed (rolled) glassy, annealed glassy and crystallized states. The boson heat capacity peak increases with strain. It is concluded that the shear band formation is accompanied by an increase of the number of low-energy vibrational states. Further annealing at temperatures up to the crystallization temperature shows that the boson heat capacity peak in deformed glass relaxes faster and to a lower level compared to that of the as-quenched state after annealing both below and above the glass transition temperature $T_g$. Possible reasons of such behavior are discussed.

a) E-mail: mitrofanovyup@gmail.com