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# Composites of AISI 316L Stainless Steel and nanocrystalline Ti-B-C Ceramic Powders

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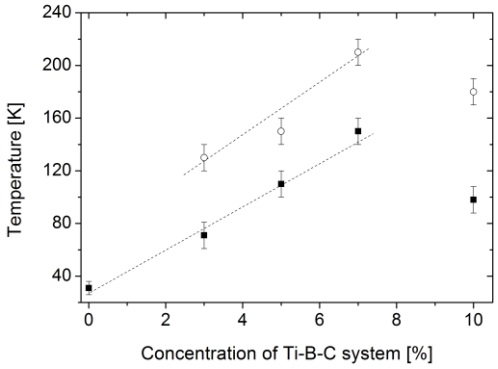


The temperature of separation and the temperature of maximum of magnetization measured in ZFC modes versus concentration of Ti-B-C system in 316L austenitic steel in a magnetic field of 100 Oe, empty and full circles, respectively. Involving the superparamagnetic model, we can interpret not only the low-field dependence of the ZFC and FC magnetization, but also a linear change of $T_{max}$ and $T_{ir}$ with increasing dopant concentrations up to 7 vol. %

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## Abstract

Series of nanocrystalline TiC, $TiB_2$, and $B_4C$ powders as dopants embedded in an AISI 316L austenitic steel have been prepared by the selective laser melting technique and investigated by ferromagnetic resonance and magnetic measurements [1]. The homogeneous composites with the dopants up to $x$ = 7 vol. % exhibit superparamagnetic properties, characterized by i) bifurcation between the field-cooled $M_{FC}(T)$ and zero-field cooled $M_{ZFC}(T)$ magnetization below $T_{ir}$ and ii) a maximum at $T_{max}$ in low-field $M_{ZFC}(T)$ curves. We found that the $T_{ir}$ and $T_{max}$ values depend proportionally on the dopant concentrations $x$. The magnetization measurements in fields above 1000 Oe suggested an induced phase transition from superparamagnetic state to ferromagnetic one but presumably without long-range magnetic correlation. An analysis of magnetic anisotropic energy barrier distributions implied that different sizes and compositional types of dopants may contribute to the superparamagnetic relaxation process. The results demonstrate possibility of obtaining new steel-based materials with desired properties and potential applications as combining magnetic and mechanical advantages.

Several AISI steel balls with different diameters and thermal treatments (nitriding processes) were investigated using FMR and SQUID techniques. The aim of the presented investigations was to find some general relations between different chemical composition of a steel, different diameters of balls, different procedure of a thermal treatment, different depths of core shells formed as an effect of the above processes, and properties concluded from the FMR and SQUID investigations [2].

**Keywords:** AISI 316L; nanocrystalline powders; magnetization, superparamagnetism

**References**

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