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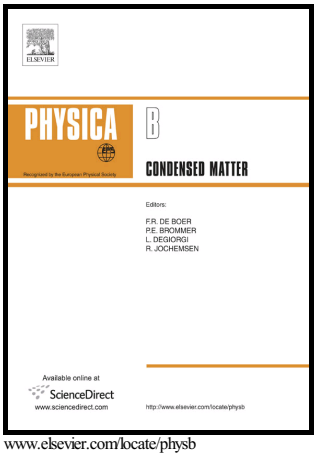

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Explanation of relatively high values of the magnetic entropy change in single crystalline terbium

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Abstract

Heat capacity and magnetization data from 5 to 300 K at applied magnetic fields of up to 100 kOe were used to determine the entropy change of single crystalline terbium. This was found to be relatively high in comparison with other heavy rare-earths possessing comparable magnetic moments. In addition, the refined magnetic phase diagram of Tb was used to estimate the main contributions to the entropy change and compared to that of the giant magnetocaloric effect in $Gd_5(Ge_2Si_2)$.

INTRODUCTION

The real 'boom' in the study of the magnetocaloric effect (MCE) that has been observed over the last few decades [1, 2] has focused primarily on finding the best magnetocaloric material for magnetic refrigeration. The majority of these papers, however, are devoted to a more or less 'routine' description of the 'prospective' refrigerant's properties. Despite this fact, a magnetocaloric material with higher performance than that of Gd, which is now used in real prototypes of magnetic refrigerators, has not yet been found. At the same time, one can notice that the newly prepared magnetocaloric alloys and compounds, as a rule, include a lanthanide and/or a transition metal, which is not surprising given that lanthanide metals possess the highest possible values of magnetic moment per atom [3] and thus have the potential to reveal significant