I-4

Newly synthesized Cr_2Sb thin film on GaAs(111)

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Epitaxial ferromagnetic or ferrimagnetic thin films on semiconductor have attracted much interestsfor spintronic devices. The transition metal (TM) based metallic compounds are examples of materials of interest for such applications. Arsenide (As) and antimonide (Sb) of TM with formula $M_2(As,Sb)$ (M= Mn, Fe, Cr) usually crystallize in three different crystal structure types such as hexagonal P62m, tetragonal P4/nmm or orthorhombic Pmma. The most stable crystal structure of $M_2(As,Sb)$ (M= Mn, Fe, Cr) is tetragonal. The reported tetragonal Mn_2As, Mn_2Sb, Fe_2As, and Cr_2As materials haveantiferromagnetic ordering at 573, 550, 325, and 393 K, respectively. However, to the best our knowledge, the synthesis of Cr_2Sb has not been reported yet. Here we report on the synthesis of Cr_2Sb using MBE (molecularbeam epitaxy) and their structural, electrical and magnetic properties. The crystal structure of Cr_2Sb thin film grown on GaAs(111) substrate at 500 ℃ was tetragonal with the lattice constant of a=3.758 Å, c=6.259 Å. The metallic electrical resitivity was observed. The magneto-transport and antiferromagnetic magnetic properties will be discussed in detail.

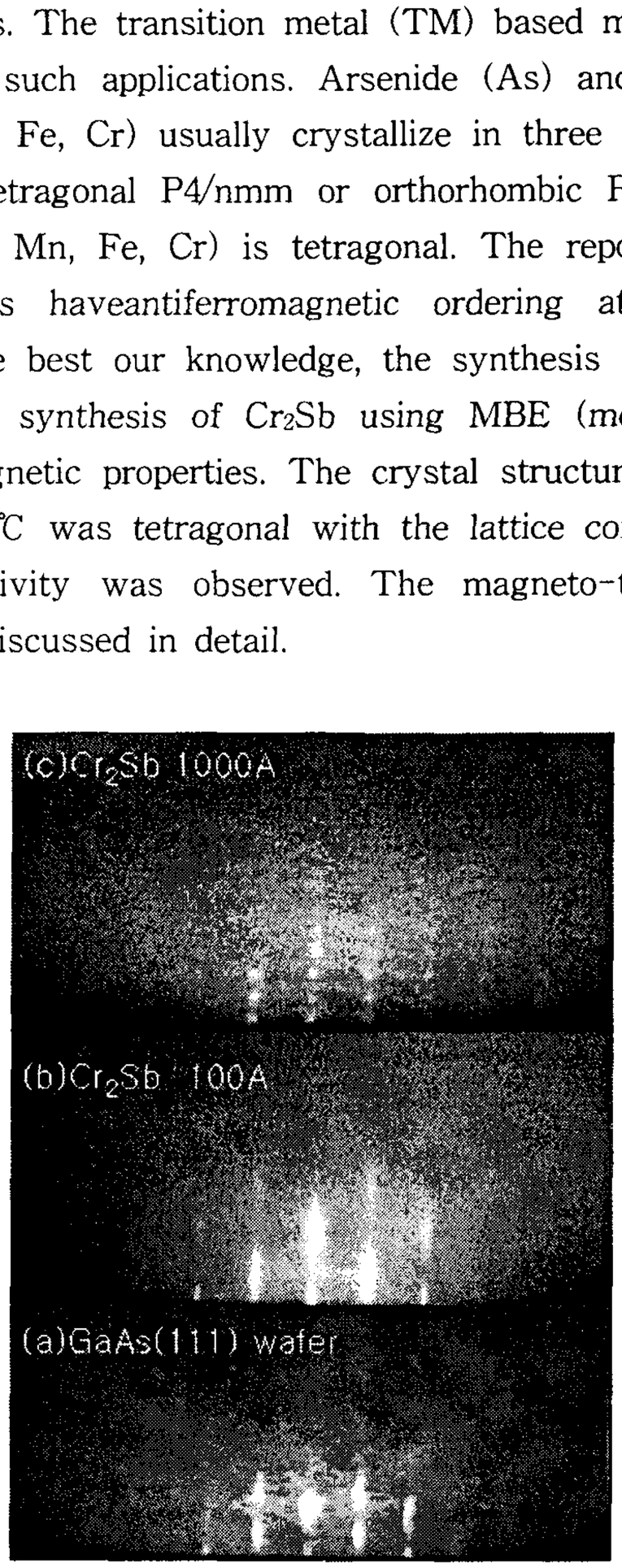

Fig. 1. The RHEED patterns of (a) GaAs (111), (b) 158 Å, and (c) 1000 Å of Cr_2Sb thin film with growth temperature at 500 ℃.

References

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