

SURFACE DEFECTS ON PbTe EPILAYERS

¹Hwang, M.K.; ¹de Melo, F.C.L.; ¹Salgado, E.G.C.; ¹Guimarães, S. & ²Bressiani, Ana H.A.
¹Divisão de Materiais, Instituto de Aeronáutica e Espaço, Centro Técnico Aeroespacial, Praça
Marechal do Ar Eduardo Gomes nº 50, Vila das Acácias, 12228-904, São José dos Campos –
SP, miriamk@usp.br; ²Divisão de Materiais Cerâmicos, Departamento de Engenharia de
Materiais, Instituto de Pesquisas Energéticas e Nucleares

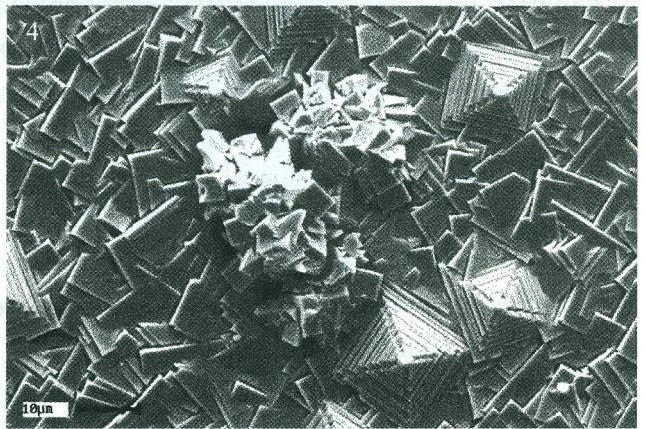
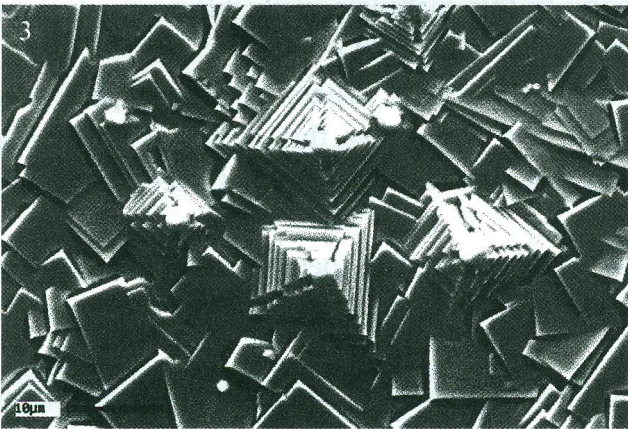
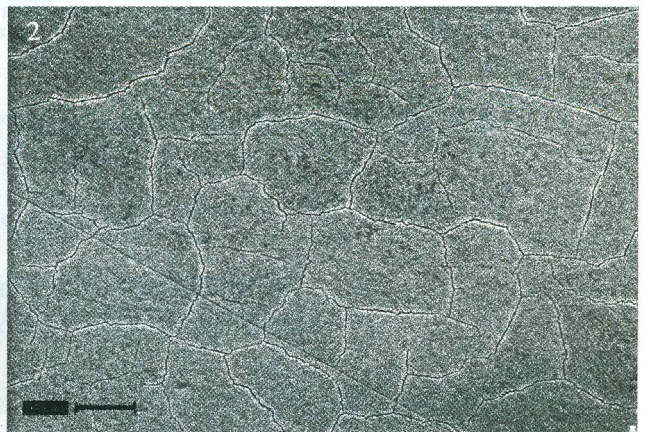
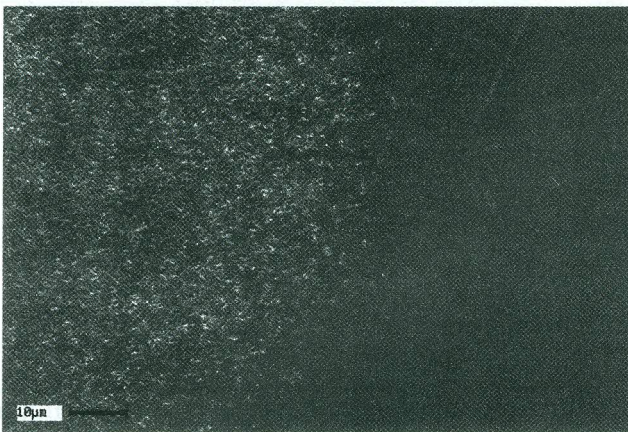
In this work, Scanning Electron Microscopy (SEM) was employed to study defects on the lead telluride (PbTe) epilayers surface, grown over silicon (Si) substrate <100>, by Hot Wall Epitaxy System (HWE).

HWE technique is used for single crystal growth with excellent quality, but sometimes the crystallinity perfection is jeopardized by bad growth conditions.

Analyzing epilayers SEM micrography it was noticed:

- a) there are two surfaces regions: a central mirror-like and a milk-like that is placed around the first one (Fig. 1). By x-ray diffraction it was seen that the mirror-like is a single crystal layer, and the milk-like is poly crystal. The better explanation for the existence of these regions is a temperature gradient during the layer growth;
- b) cracks on the PbTe layers, which may be caused by great thermal expansion linear coefficient difference between PbTe and Si, and the crystal lattice mismatch between them (Fig. 2);
- c) steps and pyramids formation, which is usually explained by Stranski-Krastanov model (layer plus island), where the temperature and the layer thickness work together to get this result (Fig. 3);
- d) the nucleation that appears on the layer surface means that the PbTe particles are interacting between themselves more than with the substrate. (fig. 4).

The SEM technique is very powerful to detect surface defects, making easy the understanding of growth layer mechanism, in order to improve the layer quality.



Figures: 1-Poly crystal region left side and single crystal region right side. 2- Cracks. 3- Steps and pyramids formation. 4- Nucleation.