Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Crystallization thermodynamics and kinetics of $SmCo_5$/Fe system. CHUANBING RONG, J. PING LIU, Department of Physics, University of Texas at Arlington, Arlington, TX 76019 — High energy ball milling is an effective and economic way to produce the hard/soft nanocomposite permanent magnetic materials which have immense potential to exhibit much higher energy products than the conventional single phase hard magnets. Intermetallic materials undertaken high energy ball milling are usually of amorphous structures. It is therefore necessary to study the grain nucleation and growth behavior of the ball-milled amorphous powders. There has not been a systematical study of thermal dynamic and kinetic behavior of the mechanically milled nanocomposite powders. In this work, powder mixtures of $SmCo_5$ + x α-Fe (x=0-30 wt%) were mechanically milled for 2 - 10 hours. The thermal dynamic and kinetic behavior of the powders was studied by measuring the differential scanning calorimetry (DSC) curves with different heating rate and isothermal methods. It was observed that the crystallization process of the $SmCo_5$ phase shifted to high temperature while that of Fe phase shifted to low temperature with increasing milling time. Kissinger analysis shows that the activation energy of $SmCo_5$ phase significantly decreased with increasing milling time and increasing Fe content. Isothermal analysis showed that the nucleation of $SmCo_5$ phase started around 300-350 ^{o}C which is 100-150 ^{o}C lower than the crystallization temperature (460 ^{o}C).

Chuanbing Rong
Department of Physics, University of Texas at Arlington, Arlington, TX 76019

Date submitted: 20 Nov 2008 Electronic form version 1.4