THE EFFECT OF CHEMICAL ATTACK ON STRUCTURAL AND MAGNETIC PROPERTIES OF FeRh BULK ALLOYS

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The $Fe_{100-x}Rh_x$ alloys ($48 \leq x \leq 52$ at%), present a Magnetocaloric Effect (MCE) close to room temperature (RT), and first-order phase transition from antiferromagnetic (AFM) to ferromagnetic (FM) state during heating and vice versa on cooling, leading to abrupt and large changes of magnetization (ΔM). These occur without crystallographic symmetry change in the chemical orderingCsCl-type crystal structure (α´). On the other hand, exist in the whole range of Rh composition, a second microstructure on high temperature γ phase (fcc). E.Navarro, et al., reported the transformation of α´ to γ after 24 hours (h) of ball-milling and recovered the α´ after thermal annealing. This suggests that is possible to change the microstructure surface by mechanical attack or annealing. Most recently, theoretical works in the density functional theory (DFT), report the possibility to obtain orthorhombic and tetragonal structures on FeRh bulk alloys, formed from α´ phase after the mechanical attack. X-ray diffraction is a technique for investigating the structure surface; it can directly reveal the internal structure in the range of ~ 0.5 to 2.5 Å (equal to 10^{-8}cm). Therefore, on bulk alloys these techniques show a small fraction of microstructure on surface sample. Chemical attack is used to produce an oxidation-reduction reaction and dissolves the oxide, removing a part of the bulk surface and revealing the real crystal phase of the sample. We have investigated the effect of a chemical attack on the surface of induction melted $Fe_{50}Rh_{50}$bulk alloy, which was cut into several slices whose magnetostructural transition (MET)was characterized by RT X-ray diffraction and thermomagnetic M(T)curve at 5 mT and 2 T. Select one of the slices for effect the polish followed to a chemical attack make whit a mix of hydrochloric (HCl) acid with nitric (HNO_3)acid during 210 min; and observed the changes on microstructural phase generate during the mechanical and chemical attack. As a result of this analysis, we conclude that the effects generated by the surface for mechanical and chemical attack produce changes in the microstructural phase, but these changes do not affect the magnetic properties.

Keywords: Iron-rhodium alloys, Crystal-structure, Magnetocaloric effect

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