ABSTRACT

The object of this research consists of investigating the structural, magnetic and hiperfine properties of the pseudobinar Laves phases compounds $Hf(Fe_{1-x}Cr_x)_2$ and $(Nb_{1-x}Zr_x)Fe_2$. We prepared polycristaline samples alloys and for synthesis melting in the concentrations: x = 0.0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 e 1.0, for the $Hf(Fe_{1-x}Cr_x)_2$ and in the concentrations: x = 0.0, 0.1, 0.2, 0.3, 0.4 e 0.5 for $(Nb_{1-x}Zr_x)Fe_2$. We melted them in an arc furnace under pure Argon (99.999%) gas atmosphere. We investigated the cristaline structure of the alloys by the powder XRD technique, obtaining lattice parameters and confirming the structure of hexagonal phase C14 for the samples $Hf(Fe_{1-x}Cr_x)_2$ in the concentrations $0.0 \leq x < 0.9$ and also in all the other samples produced of $(Nb_{1-x}Zr_x)Fe_2$.

We investigate the magnetic properties of $Hf(Fe_{1-x}Cr_x)_2$ alloys bye the technique of magnetization at low temperatures and low magnetic field applied until 7 T and high magnetic field applied until 16 T. The susceptibility AC and DC at low magnetic fields and temperatures of 4.2 K until 300 K indicated that alloys of concentrations $0.4 \leq x < 0.8$ show spin glass behavior, in $x \leq 0.3$ they are magnetic clusters with short range interactions, and in x = 0.9 is superparamagnetic. The values of the magnetic moments for atom of Fe were calculated for all samples.

We measured Mössbauer spectra of the same samples of $Hf(Fe_{1-x}Cr_x)_2$ at room temperature, obtaning two sextets for the samples with $x < 0.2$ and two quadrupolar doublets for the other compositions, that would be attributed to the cristalographic sites 2a and 6h.

Also the Mössbauer spectrum of the samples $(Nb_{1-x}Zr_x)Fe_2$ at temperature of 4.2 K without magnetic field applied and with magnetic field applied of 6 and 12 T, suggest that those compounds show coexisting ferromagnetic and antiferromagnetic phases. We could note for the compound $(Nb_{0.6}Zr_{0.4})Fe_2$ a possible existence of the paramagnetic behavior in the Fe of the cristalographic site 2a, but the magnetic moment in this site is not zero.