

Contribution ID : **205** Type : **Poster**

57Fe and 119Sn Mössbauer, XRD and ZFC/FC magnetization studies of arc melting FeSn2 alloys

Four $FeSn_2$ alloy samples were synthesized via arc-melting in an argon atmosphere, annealed at 450℃ for 4 days, and quenched in cold water. Structural, magnetic, and hyperfine properties were systematically investigated using X-ray diffraction (XRD), ZFC/FCC magnetization (3–300 K), and ^{57}Fe and ^{119}Sn Mössbauer spectroscopies at room temperature. XRD analysis confirmed a predominant tetragonal $FeSn_2$ phase (space group I4/mcm) alongside a minor □-Sn ($I4_1/amd$), with one sample exhibiting an additional equiatomic FeSn phase. Temperature-dependent magnetization (□–□) revealed magnetic transitions at 50 K and 123 K, while (□–□) loops (3 and 300 K) indicated a superposition of ferro and antiferromagnetic signals. Room-temperature ^{57}Fe Mössbauer spectra showed localized magnetism with a hyperfine field of □$_{hf}$=11.2 □, attributed to the ordering of Fe 3d magnetic moments. Meanwhile, ^{119}Sn Mössbauer spectra revealed a transferred hyperfine field □=2.34 □ induced by neighboring Fe atoms, in good agreement with Medina et al. [1].

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Session Classification : Poster Fisica del Estado Solido