ELECTROCHEMICAL LITHIATION OF RSn$_2$ (R = Tb, Dy) INTERMETALLICS

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Systematic studies of the electrochemical lithiation of Sn-containing intermetallics showed that Li-containing solid solutions are formed. These solid solutions often have large homogeneity range with dual mechanism of formation: inclusion and partial substitution. This is the motivation to continue the research of high-entropy multicomponent systems. At the first stage we studied the electrochemical lithiation of two Sn-containing binary intermetallics $TbSn_2$ and $DySn_2$ with $ZrSi_2$-type structure (space group *Cmcm*, Pearson`s code *oS*12). Further, we will obtain maximally disordered multicomponent solid solutions based on these binary phases.

Samples with nominal composition $R_{33.3}Sn_{66.7}$ were synthesized by arc-melting, remelted two times for better homogenization and annealed at 400 ºC for 1 month. X-ray phase analysis (DRON-2.0M, Fe$K\alpha$-radiation) and scanning electron microscopy (Tescan VEGA3 LMU) showed that the samples consisted of two phases: RSn$_2$ and minor amount of R_3Sn_7 (Tb_3Sn_7-type structure, space group *Cmmm*). An energy dispersive X-ray spectroscopy (EDX-analyzer with X-Max^{N}20 detector) confirmed the composition of these phases. Electrochemical lithiation/delithiation of the studied alloys were carried out in Swagelok-type battery prototype using a $LiCoO_2$ (α-$NaFeO_2$-type, space group R-3m) powder as a positive electrode and an electrolyte consisting of 1 M $LiPF_6$ solution in the mixture of aprotic solvents. Lithiation-delithiation processes were observed to be two-stage and reversible. After lithiation partial amorphization of the grains and aggregation of irregular-shape particles occurred (Fig.).

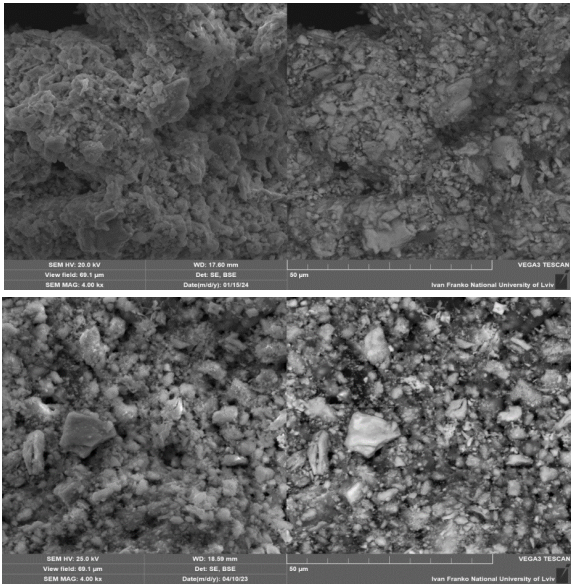

Fig. SEM-images of $TbSn_2$:Li_x (a) and $DySn_2$:Li_x (b) at 4000x magnification

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