Chemical-Partitioning in $(Co_{1-x}Ni_x)_{88}Zr_7B_4Cu_1$ Soft Magnetic Nanocrystalline Alloys

In our study, a series of $(Co_{1-x}Ni_x)_{88}Zr_7B_4Cu_1$ alloys (x = 0, 0.25, 0.5, 0.75, and 1) were fabricated by melt spinning, followed by an isothermal anneal to produce nanocomposite alloys (i.e. nanocrystalline grains in aresidual amorphous matrix). The alloy series was designed to investigate crystallization kinetics and limits to the composition regime where a nanocomposite could be formed. The effect of Ni on the magnetic properties of (Co,Ni)-based amorphous and nanocrystalline alloys was determined and as expected Ni reduced the soft magnetic properties of the alloys. As x exceeded 0.75, the as-spun ribbons exhibited partial crystallization, resulting in reduced exothermic crystallization peaks. Transmission electron microscopy and atom probe tomography specimens were prepared from specific compositions and annealing treatments from which the phase and chemical-partitioning was quantified.