Abstract Submitted
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Synthesis of $CeFe_{10.5}Mo_{1.5}$ with $ThMn_{12}$-Type Structure by Melt Spinning[1] CHEN ZHOU, MEDA Engineering and Technical Services LLC, MISLE TESSEMA, Optimal CAE Inc., MARTIN MEYER, FREDERICK PINKERTON, GM R and D Center — Rare earth compounds $RFe_{12-x}M_x$ with tetragonal $ThMn_{12}$-type structure are of great interest for potential applications as permanent magnets. These materials serve as precursors for nitriding and hydriding, processes which can dramatically increase the Curie temperature, spontaneous magnetization, and affect the magnetic anisotropy. We report the phase study of $CeFe_{10.5}Mo_{1.5}$ samples melt spun at various surface wheel speeds v_s between 5 and 60 m/s. The results from quantitative Rietveld analysis indicate that the as-spun ribbons are a mixture of primary $CeFe_{10.5}Mo_{1.5}$ phase with impurity phases such as Ce_2Fe_{17}, Fe-Mo compound and $CeFe_2$. At wheel speeds v_s below 25 m/s, $CeFe_{10.5}Mo_{1.5}$ phase accounts for greater than 85 wt%, while the Fe-Mo compound is the only detectable impurity phase. Above v_s = 25 m/s, as the wheel speed increases, $CeFe_{10.5}Mo_{1.5}$ phase decreases monotonically to about 60 wt% at v_s = 60 m/s while the amounts of impurity phases increase. Thermogravimetric measurement indicates that the Curie temperature T_c of the $CeFe_{10.5}Mo_{1.5}$ phase is 340 K. As a result, the best performing sample melt spun at v_s =15m/s only exhibits an energy product BH_{max} =0.121 MGOe at room temperature. Although such a number is modest for a permanent magnet, nitriding is expected to greatly enhance the Curie temperature, and hence the magnetic performance.

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