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Mechanochemical synthesis of $(Sm,Pr)_2(Co,Fe)_{17}$ powders for nanocomposite permanent magnets[1] GEORGE HADJIPANAYIS, ALEXANDER GABAY, WANFENG LI, University of Delaware — Bottom-up fabrication of nanocomposite permanent magnets with enhanced maximum energy product requires large quantities of high-coercivity powder with crystallographically anisotropic particles tens of nanometers in size. In this work, we report a systematic study aimed to employ combination of intensive mechanical milling and calciothermic reduction for preparation of polydispersed $(Sm,Pr)_2(Co,Fe)_{17}$ powders with a predominant-to-significant part of the particles smaller than 100 nm. In addition to the effects of Pr and Fe on the hard magnetic properties of the particles, the study analyzes the influence of excess reducing agent Ca and that of the heat treatment on the particle size distribution, their chemical/structural homogeneity and crystallographic anisotropy. Emphasized is the likely role of the excess Ca facilitating the diffusion-enabled particle growth. Remanent magnetization up to 106 emu/g and intrinsic coercivity up to 14 kOe were obtained.

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