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Characterization of barium hexaferrite thick films deposited by aerosol deposition method[1] SCOOTER JOHNSON, SHU-FAN CHENG, MING-JEN PAN, FRITZ KUB, CHARLES EDDY, U.S. Naval Research Laboratory — We present results on the first deposition of nano-crystalline barium hexaferrite ($BaFe_{12}O_{19}$) (BaM) powder onto copper, silicon, and sapphire substrates using the aerosol deposition method (ADM). BaM is an important magnetic compound with many applications, including, permanent magnets, magnetic recording, and components in electronic circuits. Advantages of the ADM include the ability to form up to hundreds of microns thick, dense ceramic films at room temperature at high deposition rate on a variety of substrates. Deposition is achieved by creating a pressure gradient that accelerates particles in the aerosol to high velocity. Upon impact with the target the particles fracture and embed. Continual deposition forms the thick compacted film. Scanning electron microscopy and profilometry suggest that the film is compact and well adhered to the substrate surface. We compare magnetization curves of the raw nano-crystalline powder, pressed sintered powder, and deposited film. Our typical values of magnetic saturation are about 60 emu/g, coercive field 2 kOe, remnant magnetization 30 emu/g, and squareness 0.5. The similarity between the deposited films suggests comparable deposition quality across this range of substrate hardness. The reduction in remnance and saturation compared with the powder may suggest a more random orientation of moments and an increase in fracturing of the particles. We conclude with preliminary attempts to magnetically align particles during deposition.

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