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Multiferroic fluoride $BaCoF_4$ Thin Films Grown Via Molecular Beam Epitaxy[1] PAVEL BORISOV, TRENT JOHNSON, West Virginia University, CAMILO GARCA-CASTRO, Universite de Liege, Belgium, AMIT KC, DUSTIN SCHRECONGOST, CHENG CEN, ALDO ROMERO, West Virginia University, DAVID LEDERMAN, West Virginia University; University of California, Santa Cruz — Multiferroic materials exhibit exciting physics related to the simultaneous presence of multiple long-range orders, in many cases consisting of antiferromagnetic (AF) and ferroelectric (FE) orderings. In order to provide a new, promising route for fluoride-based multiferroic material engineering, we grew multiferroic fluoride $BaCoF_4$ in thin film form on Al_2O_3 (0001) substrates by molecular beam epitaxy. The films grow with the orthorhombic b-axis out-of-plane and with three in-plane structural twin domains along the polar c-axis directions. The FE ordering in thin films was verified by FE remanent hysteresis loops measurements at T = 14 K and by room temperature piezoresponse force microscopy (PFM). An AF behavior was found below Neel temperature $T_N \sim 80$ K, which is in agreement with the bulk properties. At lower temperatures two additional magnetic phase transitions at 19 K and 41 K were found. First-principles calculations demonstrated that the growth strain applied to the bulk $BaCoF_4$ indeed favors two canted spin orders, along the b- and a-axes, respectively, in addition to the main AF spin order along the c-axis.

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