

Room-temperature multiferroic behavior in layer-structured Aurivillius phase ceramics

Cite as: Appl. Phys. Lett. **117**, 052903 (2020); <https://doi.org/10.1063/5.0017781>

Submitted: 09 June 2020 . Accepted: 25 July 2020 . Published Online: 07 August 2020

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Submitted: 9 June 2020 · Accepted: 25 July 2020 ·

Published Online: 7 August 2020 · Corrected: 11 August 2020



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ABSTRACT

Multiferroic (MF) Aurivillius phase (AP) ceramics with the general formula $B_5F_2C_3O_{18}$ ($B = \text{La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Y, Lu}$) have been investigated by X-ray diffraction (XRD), Raman scattering, and *in situ* XRD. The XRD patterns show that the AP structure is well indexed to the $B_5F_2C_3O_{18}$ phase. The Raman spectra show that the AP structure is well indexed to the $B_5F_2C_3O_{18}$ phase. The *in situ* XRD patterns show that the AP structure is well indexed to the $B_5F_2C_3O_{18}$ phase.

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Multiferroic (MF) Aurivillius phase (AP) ceramics with the general formula $B_5F_2C_3O_{18}$ ($B = \text{La, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Y, Lu}$) have been investigated by X-ray diffraction (XRD), Raman scattering, and *in situ* XRD. The XRD patterns show that the AP structure is well indexed to the $B_5F_2C_3O_{18}$ phase. The Raman spectra show that the AP structure is well indexed to the $B_5F_2C_3O_{18}$ phase. The *in situ* XRD patterns show that the AP structure is well indexed to the $B_5F_2C_3O_{18}$ phase.

$T_1 \sim 494$ K
 $T_2 \sim 353$ K
 $T_3 \sim 425$ K
 $T_4 \sim 504.6$ K
 $T_5 \sim 399$ K
 $T_6 \sim 399$ K
 $T_7 \sim 399$ K
 $T_8 \sim 399$ K
 $T_9 \sim 399$ K
 $T_{10} \sim 399$ K
 $T_{11} \sim 399$ K
 $T_{12} \sim 399$ K
 $T_{13} \sim 399$ K
 $T_{14} \sim 399$ K
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 $T_{99} \sim 399$ K
 $T_{100} \sim 399$ K

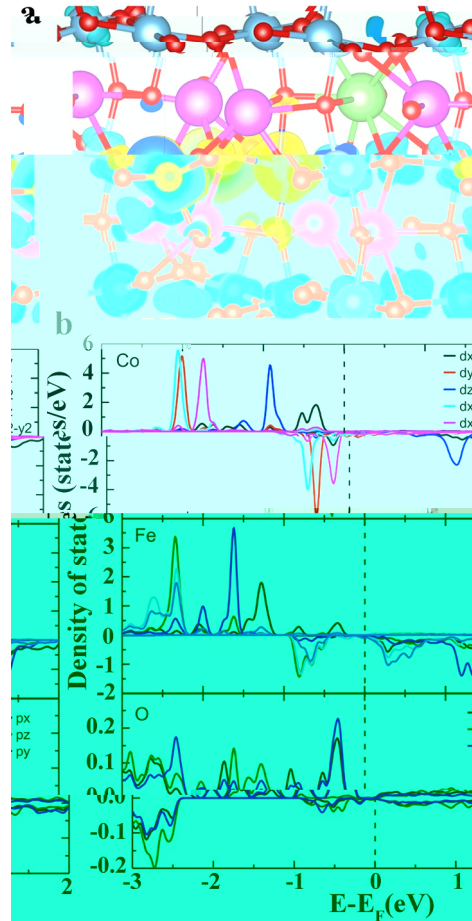


FIG. 3. (a) Crystal structure of BLFC showing Co, Fe, and O atoms. (b) Density of states (DOS) for Co, Fe, and O atoms, showing d-orbitals (dx²-y², dxy, dz², dxz, dyz) and their contributions to the total DOS.

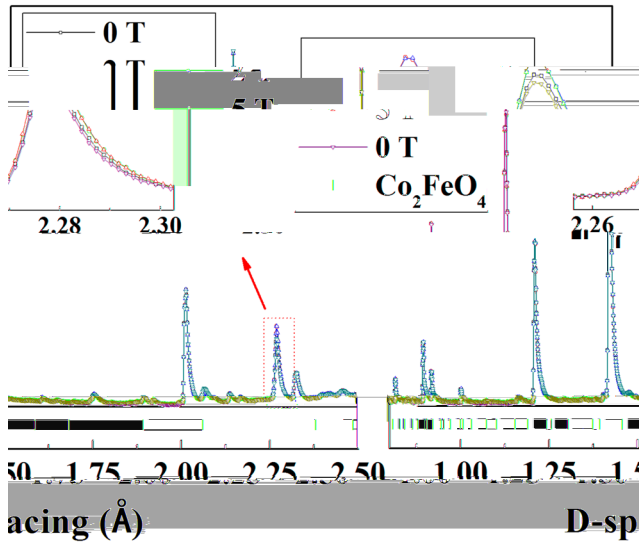


FIG. 4. XRD patterns of Co_2FeO_4 at 0 T and 1 T. The inset shows the schematic of the sample and measurement setup.

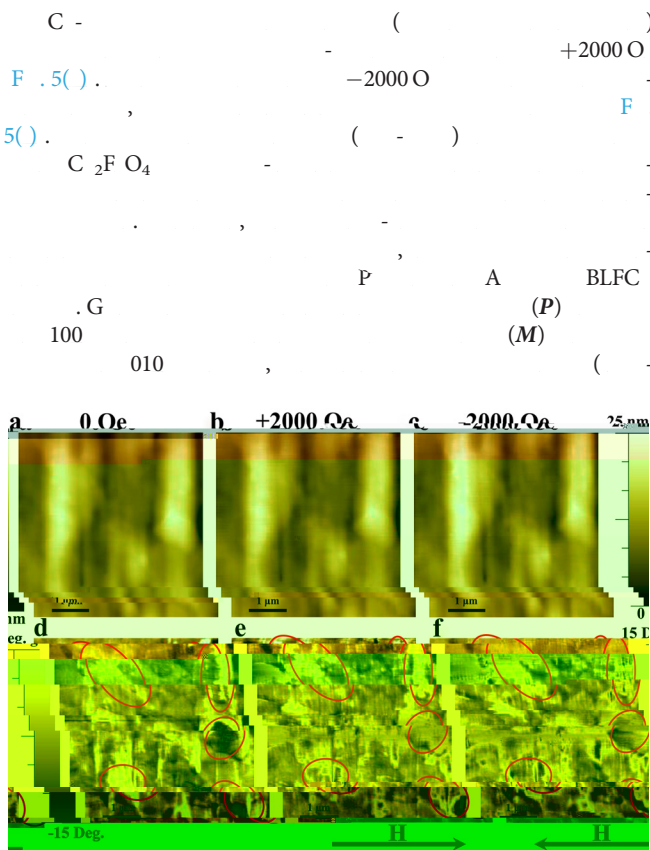


FIG. 5. MFM images of Co_2FeO_4 at 0 Oe, +2000 Oe, and -2000 Oe. The inset shows the schematic of the sample and measurement setup.

$T = P \times M$
 BLFC
 I , A BLFC
 F
 $\text{C}^{3+} \text{O} \text{C}^{3+}, \text{F}^{3+} \text{O} \text{C}^{3+}$
 $\text{F}^{3+} \text{O} \text{F}^{3+}$
 A , C / F
 EM (ED)
 BLFC
 D . M , P D . K , D.
 D I H I I N , AL,
 D , O K.
 A E D F
 G A A (G N . 2/
 0038/20), C (G N . K2015-0602006), N FC (G
 N . 11474138 11834005). A
 E M P (EM P)
 P IND54 N EM P
 EM P E AME E

DATA AVAILABILITY

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