Department of Applied Physics

Prof. KWOK Kin Wing

Professor
Associate Dean of Faculty of Applied Science and Textiles

Phone Number	(852) 2766 5667
Email	apkwkwok@polyu.edu.hk
Education	Ph.D. The Hong Kong Polytechnic University
	M.Phil. The Chinese University of Hong Kong
	B.Sc. The Chinese University of Hong Kong
Research Interests	Processing, Characterization and Applications of Ferroelectric Materials, Electro-optic Materials, Photoluminescence Materials
ORCiD	0000-0001-6742-4180
Publication	174
H-index	34
Sum of the Times Cited	3571

Patents

- X.X. Wang, **K.W. Kwok**, H.L.W. Chan and S.H. Choy, "Piezoelectric Ceramic Composition and the Method for Preparing the Same", US Patent, No. US 7,494,601
- H.L.W. Chan, T.Y. Lam, C. Chen and **K.W. Kwok**, "Method and Apparatus for Measuring Oscillation Amplitude of an Ultrasonic Bonding Tool", US Patent, No. US 7,819,013
- D.M. Lin, **K.W. Kwok** and H.L.W. Chan, "鈮酸鈉甲鋯 鈦酸鋇無鉛壓電陶瓷組合物", Chinese Patent, No. ZL200710006787.2

Book Chapters

- **K.W. Kwok**, T. Lee, S.H. Choy and H.L.W. Chan, "Lead-free piezoelectric transducers for microelectronic wirebonding applications" Chapter 8, Piezoelectric Ceramics, Edited by Ernesto Suaste Gomez SCIYO.
- **K.W. Kwok** and Dunmin Lin, "Preparation and piezoelectric properties of K0.5Na0.5NbO3-based lead-free piezoelectric ceramics", Chapter 3, Ferroelectrics: New Research, Edited by X.L. Huang and S.L. Ma, NOVA Science Publishers Inc.

Publications *(selected)*

- Hailing Sun, Xiao Wu, Dengfeng Peng and **K.W. Kwok**, "Room temperature large and reversible modulation of photoluminescence by in-situ electric field in ergodic relaxor ferroelectrics", ACS Applied Materials & Interfaces 9 (**2017**) 34042-34049.
- Hailing Sun, Xiao Wu, Tat Hang Chung and **K.W. Kwok**, "In-situ electric field-induced modulation of photoluminescence in Pr-doped $Ba_{0.85}Ca_{0.15}Ti_{0.90}Zr_{0.10}O_3$ Lead-Free Ceramics", Scientific Reports 6 (**2016**) 28677.
- S.B. Lu, Z.K. Xu, **K.W. Kwok** and H.L.W. Chan, "Hot- stage transmission electron microscopy study of (Na,K) NbO_3 based lead-free piezoceramics", Applied Physics Letters 105 (**2014**) 042904.
- Faliang Li and **K.W. Kwok**, "Fabrication of transparent electro-optic $(K_{0.5}Na_{0.5})_{1-x}Li_xNb_{1-x}Bi_xO_3$ lead-free ceramics", Journal of the European Ceramic Society 33 (**2013**) 123-130.
- Xiao Wu, **K.W. Kwok** and Faliang Li, "Upconversion fluorescence of sol-gel-derived Er-doped KNN ceramics", Journal of Alloys and Compounds 580 (**2013**) 88-92.
- D.Y. Wang, Dunmin Lin, **K.W. Kwok**, N.Y. Chan, J.Y. Dai, S. Li and H.L.W. Chan, "Ferroelectric, piezoelectric, and leakage current properties of $(K_{0.48}Na_{0.48}Li_{0.04})(Nb_{0.775}Ta_{0.225})O_3$ thin films grown by pulsed laser deposition", Applied Physics Letters 98 (**2011**) 022902.
- C.G. Xu, Dunmin Lin and **K.W. Kwok**, "Structure, electrical properties and depolarization temperature of $(Bi_{0.5}Na_{0.5})TiO_3$-$BaTiO_3$ lead-free piezoelectric of ceramics", Solid State Sciences 10 (**2008**) 934-940.

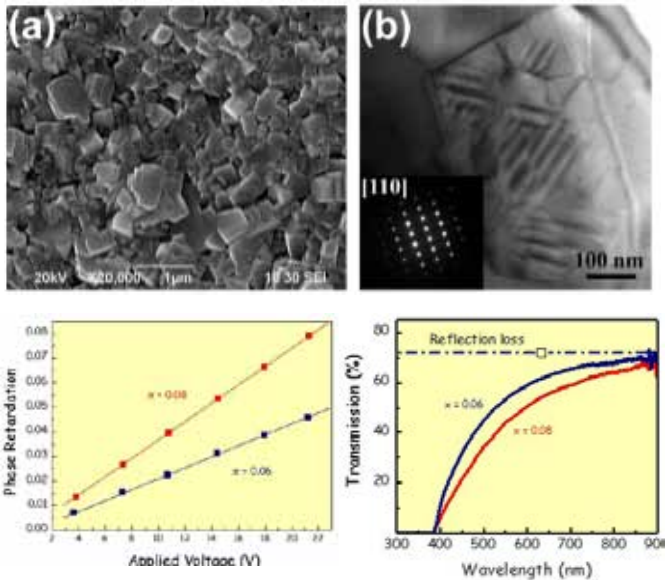
Lead-free Transparent Electro-optical $(K_{0.5}Na_{0.5})_{1-x}Li_xNb_{1-x}Bi_xO_3$ Ceramics

The first lead-free electro-optic (EO) polycrystalline ceramic with excellent transparency and strong linear electro-optic response, which are even better than the lead-based counterparts that are widely used in industries for various optoelectronic applications.

Fabrication:
Conventional atmospheric sintering techniques

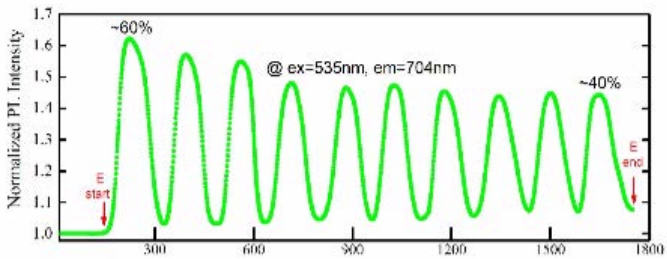
Features:
Dense & fine-grained structure
Nearly cubic crystal structure
Relaxor-like ferroelectrics

Properties:
Strong linear electro-optic response (r_c ~ 130 - 200 pm/V)
Good ferroelectric and piezoelectric properties (d_{33} ~ 80 pC/N)

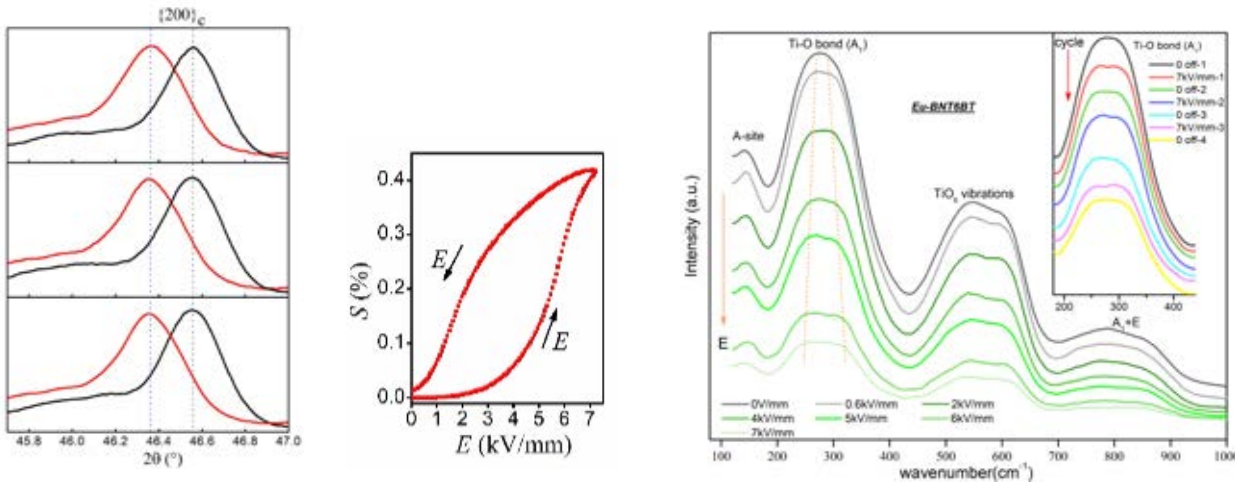


Ferroelectric Ceramics with Strong and Tunable Photoluminescence Response

Via taking the advantages of the characteristics of ferroelectric materials such as the switchable spontaneous polarization, phase transformation, ergodicity and electric field-induced strains, we have successfully realized real-time and reversible modulation of photoluminescence by in situ electric field in lead-free ferroelectric ceramics at room temperature. The physical mechanism and the interplay process between the electric field and photoluminescence have also be elucidated in detail based on the in situ structural investigation.



▶ Large and tunable photoluminescence responses of Eu–BNT6BT relaxor subject to a biased ac E field varying sinusoidally between 0 and 7 kV/mm for cycles.



▶ Reversible lattice distortion, strain and crystal deformation of Eu-BNT6BT relaxor induced by in situ electric field.