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## Research Interests

Ferroelectrics, Scanning Probe Microscopy, Local electrochemistry in Batteries & Fuel cells, Nonlinear Optics

## Research Output

### Ferroelectric domain wall p-n junctions

Maguire, J., McCluskey, C., Holsgrove, K., Suna, A., Kumar, A., McQuaid, R. & Gregg, M., 22 Nov 2023, In: Nano Letters. 23, 22, p. 10360–10366

### Unravelling spatio-temporal transient dynamics at nanoscale via wavelet transform-based Kelvin probe force microscopy

Biglarbeigi, P., Morelli, A., Pauly, S., Yu, Z., Jiang, W., Sharma, S., Finlay, D. D., Kumar, A., Soin, N. & Farokh-Payam, A., 25 Oct 2023, (Early online date) In: ACS Nano.

### High resolution spatial mapping of the electrocaloric effect in a multilayer ceramic capacitor using scanning thermal microscopy

Baxter, O. E., Kumar, A., Gregg, J. M. & McQuaid, R. G. P., 08 Sep 2023, (Early online date) In: Journal of Physics: Energy.

### Domain wall saddle point morphology in ferroelectric triglycine sulfate

McCluskey, C. J., Kumar, A., Gruverman, A., Luk'yanchuk, I. & Gregg, J. M., 29 May 2023, In: Applied Physics Letters. 122, 22, 222902.

### Tuning local conductance to enable demonstrator ferroelectric domain wall diodes and logic gates

Suna, A., McCluskey, C. J., Maguire, J. R., Holsgrove, K. M., Kumar, A., McQuaid, R. G. P. & Gregg, J. M., May 2023, In: Advanced Physics Research. 2, 5, 2200095.

### Towards spatially resolved measurements of domain wall thermal transport using scanning thermal microscopy

Kelly, R., Kurnia, F., Kumar, A., Gregg, M. & McQuaid, R., 12 Apr 2023.

### Ferrielectricity in the archetypal antiferroelectric, PbZrO<sub>3</sub>

Yao, Y., Naden, A., Tian, M., Lisenkov, S., Beller, Z., Kumar, A., Kacher, J., Ponomareva, I. & Bassiri-Gharb, N., 19 Jan 2023, In: Advanced Materials. 35, 3, 2206541.

### Conducting ferroelectric domain walls emulating aspects of neurological behavior

Suna, A., Baxter, O. E., McConville, J. P. V., Kumar, A., McQuaid, R. G. P. & Gregg, J. M., 28 Nov 2022, In: Applied Physics Letters. 121, 22, 222902.

### Polarisation topology at the nominally charged domain walls in uniaxial ferroelectrics

Tikhonov, Y., Maguire, J. R., McCluskey, C. J., McConville, J. P. V., Kumar, A., Lu, H., Meier, D., Razumnaya, A., Gregg, J. M., Gruverman, A., Vinokur, V. & Luk'yanchuk, I., 10 Nov 2022, In: Advanced Materials. 34, 45, 7 p., 2203028.

### Total electrification of large-scale nanophotonic arrays by frictional charges

Bhalla, N., Yu, Z., Pauly, S., Kumar, A., Maddi, C., Mariotti, D., Zhao, P., Farokh Payam, A. & Soin, N., 22 Sep 2022, (Early online date) In: Nanoscale Horizons.

#### **Ultrahigh carrier mobilities in ferroelectric domain wall corbino cones at room temperature**

McCluskey, C. J., Colbear, M. G., McConville, J. P. V., McCartan, S. J., Maguire, J. R., Conroy, M., Moore, K., Harvey, A., Trier, F., Bangert, U., Gruverman, A., Bibes, M., Kumar, A., McQuaid, R. G. P. & Gregg, M., 11 Aug 2022, In: *Advanced Materials*. 34, 32, 2204298.

#### **Measuring spatially resolved nanoscale heat flow in ferroelectric materials**

Kelly, R., Kurnia, F., Kumar, A., Gregg, J. M. & McQuaid, R. G. P., 30 Jun 2022.

#### **Imaging ferroelectrics: reinterpreting charge gradient microscopy as potential gradient microscopy**

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#### **Deterministic Dual control of phase competition in Strained BiFeO<sub>3</sub> : A Multi-Parametric Structural Lithography Approach**

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Yao, Y., Naden, A., Zhang, F., Edwards, D., Joshi, P., Rodriguez, B. J., Kumar, A. & Bassiri-Gharb, N., 01 Dec 2020, In: *Journal of the European Ceramic Society*. 40, 15, p. 5369-5375

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Holsgrove, K. M., Duchamp, M., Moreno, M. S., Bernier, N., Naden, A. B., Guy, J. G. M., Browne, N., Gupta, A., Gregg, M., Kumar, A. & Arredondo-Arechavala, M., 27 Jul 2020, In: *RSC Advances*. 10, p. 27954-27960 7 p.

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## **Awards**

## **Projects**

### **R3391CMM: Antiferroelectricity, Ferrielectricity and Ferroelectricity: Rediscovering the Fundamental Science of the Archetypal Antiferroelectric PbZrO<sub>3</sub> at Small Scale**

Kumar, A. & McQuaid, R.  
18/08/2022 → ...

### **R3730CMM: Far-From-Equilibrium Processing of Ferroelectric Thin Films on Glass and Polymeric Substrates**

Kumar, A.  
01/10/2015 → 15/01/2019

### **R1597CMM: Investigating Pressure Induced Conductive States on the Nanoscale: A Novel Route to Nano-circuitry**

Kumar, A.  
01/02/2016 → 06/09/2017

### **R1392CMM: Probing local ionic transport in li-ion battery cathodes**

Kumar, A.  
03/03/2014 → 28/02/2015

### **R3480CMM: Processing-Driven Nucleation Mediated Control for Manufacturing Phase-Pure Ferroelectric Hafnia**

Kumar, A.  
10/01/2023 → ...

### **R1073CMM: Quantitative Hall Voltage mapping at conducting Ferroelectric domain walls: A novel approach to extracting conduction mechanisms on the nanoscale**

Kumar, A., Gregg, M. & McQuaid, R.  
02/07/2019 → 30/06/2020