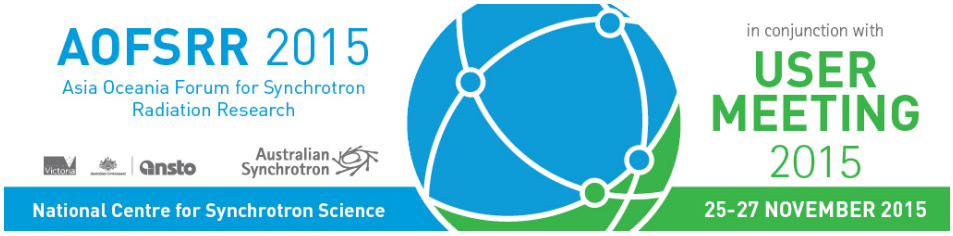

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Development of cell for in situ electric-field-dependent structural and macroscopic strain measurements

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Piezoelectric ceramics are playing an important role as sensor and actuator materials in many modern smart devices. When studying these functional materials, understanding the structural changes during the actuation process is necessary for gaining a complete picture of the structure-property relationship. Structures of such materials may be meta-stable during actuation, thus must be observed using in situ characterisation methods. In situ diffraction methods offer a powerful and direct means of quantifying the structural contributions to the strain generation mechanisms of these materials. Here, we demonstrate a sample cell equipped with a linear displacement sensor (LDS) capable of measuring the structural variations of electro-ceramic materials under high electric field, while simultaneously collecting macroscopic strain data. The results show that the macroscopic strain measured using the cells LDS can be directly correlated with the microscopic response of the material as observed by powder diffraction methods. The cell has been successfully demonstrated at the powder diffraction beamline of the Australian Synchrotron.

Keywords

X-ray diffraction, strain, electro-ceramics, piezoelectric

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