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Down Scaling in Piezoelectrics and Polar Materials: Microdevices, Nanofabrication, Small Features and Size Effects

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Piezoelectric materials in the form of thin and thick films are finding new applications in diverse fast growing fields such as wireless communications and environment monitoring. The number of applications that will benefit from availability and implementation of these films is likely to grow.

Size reduction of ferroelectric-based micro-components, both in thickness and in lateral dimensions is required for various applications. This can be achieved by a reductive approach of etching of the sintered continuous layers, or by an additive approach in which a treatment of the substrate results in the creation of patterned structures prior to the annealing step. Recent local characterization techniques, e.g. piezoelectric force microscopy, allow the analysis of properties in such small components and to manipulate them.

Various microdevices are described and issues in fabrication technology (in particular piezoelectric MEMS) are discussed. Data and interpretation of local measurements are reviewed. Size effects in ferroelectrics and their significance in emerging applications are discussed.