ACOUSTICS2008/742
Design, fabrication and characterisation of piezoelectric micromachined ultrasonic transducers

Anne-Christine Hladky-Hennion[a], Didace Ekeom[b], Fabrice Duval[a] and Eric Cattan[a]
[a]IEMN, UMR CNRS 8520, avenue Poincaré, BP 60069, 59652 Villeneuve d'Ascq, France
[b]Microsonics, 39 rue des Granges Galand, 37550 Saint Avertin, France

Micro-machined ultrasonic transducers (MUT) are investigated for phased arrays in high frequency acoustic imaging to overcome resolution and frequency limits of bulk PZT transducers currently used. The advantage of structures on silicon substrate is that transducers could be integrated with the electronics of the system. From a design point of view, finite element (FEM) codes are commonly used to model MUT, but to take into account the fluid surrounding the device radiation, scattering and the inter-mutual acoustic influence of the MUT arrays cells - the boundary element method (BEM) coupled with the finite element method is advantageously used. This paper describes the design, the fabrication and the characterisation of bending mode circular piezoelectric membranes, with operating frequency around 10 MHz. The devices are based on a PZT (lead zirconate titanate) film 1 μm thick supported by a membrane of polysilicon, 2 μm thick and SiO2, 500 nm thick. The PZT thin film was deposited following a sol-gel route. Fully-supported membranes as well as suspended cells are considered with a view to increase the resonant frequency and decrease the cross coupling between cells.