# (P.07) Characterization of custom-made thin film AlN MEMS ultrasound transducers

J Kusch, G MH Flockhart, R Bauer and D Uttamchandani

University of Strathclyde, UK

Photoacoustic (PA) imaging and sensing has attracted a lot of attention in biomedical applications. This is due to its potential in improved specificity and resolution when compared to using ultrasound as imaging source [1]. In the presented work we focus on the miniaturization of custom MEMS ultrasound receivers for applications in PA detection. These devices are of interest as they can lead to broad bandwidth transducers and have the potential for mass production with a reduction in cost [2]. The array of MEMS ultrasound receivers are fabricated using a costefficient multi-user process (PiezoMUMPs) and consist of a 500 nm thick film of aluminium nitride as piezo-active layer on a 10 µm thick silicon-on-insulator wafer. A multi-element single bandwidth and a multi-bandwidth MEMS chip have been designed with a centre frequency of 1.3 MHz and centre frequencies of 1.2 MHz, 0.6 MHz, 0.4 MHz, 0.2 MHz (smallest to largest diameter), respectively (see Fig. 1). The designs were immersed in an oil bath and characterized using the pitch-catch technique and PA excitation. The PA excitation was generated using a 10 ns Nd:YAG laser (Brilliant B, Quantel) at 532 nm and a pulse repetition frequency of 10 Hz with pulse energies of 2.6 mJ, focussed with a 30 mm lens onto a highly absorbing gelatine phantom. The devices' performance in ultrasound and PA wave detection will be shown and their advantages discussed.

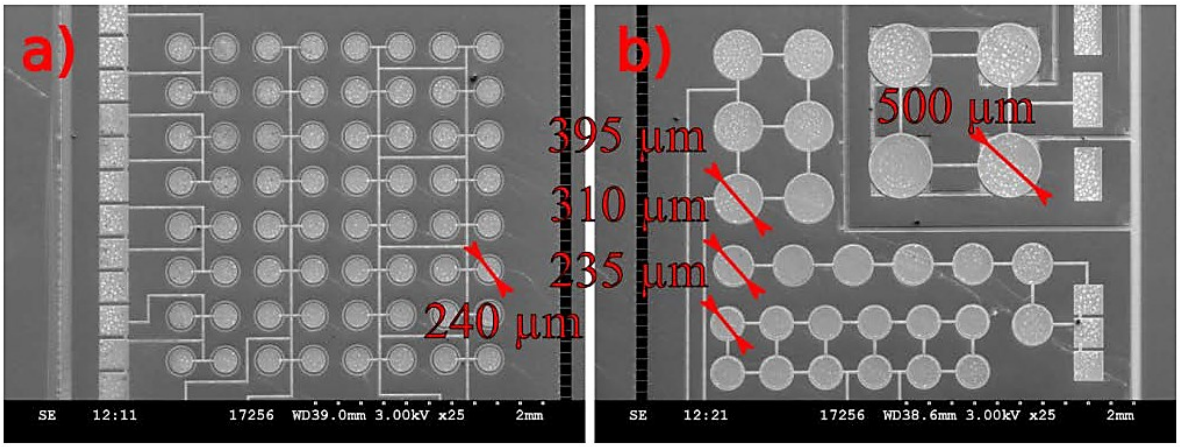


Fig 1: SEM images of the a) single bandwidth multi element transducer chip and b) the multi bandwidth transducer chip with diameters in µm.

[1] P. Beard, "Biomedical photoacoustic imaging," Interface Focus, vol. 1, no. June, pp. 602–631, 2011.

[2] A. Hajati, D. Latev, D. Gardner, A. Hajati, D. Imai, M. Torrey, and M. Schoeppler, "Three-dimensional micro
electromechanical system piezoelectric ultrasound transducer," Appl. Phys. Lett., vol. 101, no. 25, 2012.

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