

Investigation of a Commercial PZT Thick-film Composition on Various Substrates for High Frequency Ultrasonic Applications

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ABSTRACT

A fabrication process is described to fabricate an integrated structure involving a curved piezoelectric thick film. The development of this multilayer structure is performed to minimize the fabrication steps of the corresponding high frequency single element transducer. On the basis of previous work carried out in order to choose the material of each layer and in particular a porous PZT substrate directly used as the backing, a pad-printing process has been developed and used to deposit several layers of PZT paste to obtain a curved PZT thick film. The effective thickness coupling factor has a value of 47% and resonant frequency can easily reach 50 MHz. Two high frequency transducers have been successfully fabricated and characterized for medical imaging with center frequencies at 20 and 30 MHz. Very good axial resolution is obtained (41 μm at a center frequency of 20 MHz) while keeping satisfactory sensitivity. Images of human skin in vivo and of phantoms confirm the good properties delivered by the transducers using these integrated structures.