Capacitive micromachined ultrasonic tranducers: Technology and application

Abstract

Capacitive micromachined ultrasonic tranducers (cMUTs) have recently emerged as an alternative to conventional piezoelectric transducers. They offer many advantages in terms of bandwidth, fabrication of layer arrays, efficiency, and sensitivity. This research presents the principles of operation, fabrication process steps, and application of the capacitive micromachined ultrasound transducer. The study also demonstrates in detail the collapse voltage design parameter of a cMUT membrane. Several important applications are presented to show the feasibility of using cMUTs which are demonstrated by imaging examples in immersion and air due to the cMUT capability of producing large bandwidth (123% fractional bandwidth) and lower impedance mismatch. Finally, the advantages of three-dimensional echographic images based on moving ultrasound linear array its technique are discussed in detail and compared with those of two-dimensional optical hand geometry.