High Sensitive Wideband Graphene Ultrasonic Transducers

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There has been a significant innovation boost in ultrasound technologies in the past decade, with researchers striving to develop new concepts, processes and materials that enhance performance and efficacy of the current measurement, detection or imaging procedures, and open new fields of application. In GraSonics project we utilize ultrathin and highly elastic graphene layer(s) as vibrating membranes of electrostatically driven micromachined ultrasound transducers (CMUT) to enhance vibration behavior of such devices for high performance emitting and receiving wide bandwidth acoustic waves in ultrasound range, especially for air ultrasound transducers with high frequencies (higher than 300 kHz). Our objective in GraSonics arises from the fact that there is a documented need (a substantial need) for systems that can offer high precision measurement and positioning with the help of ultrasonic waves. Such systems require transducers able to emit powerful, but short pulses while having also large bandwidth as receivers. This can be achieved only with structures that are not resonant and have small impedance to be able to match the impedance of air. Graphene membranes, as the thinnest elastic membranes, are great candidates for sound devices and can offer significantly better vibration, sound generation and reception performance than metal or silicon membranes. Therefore, the central goal in GraSonics is to introduce an innovative solution that can answer the current demand for high precision and wideband ultrasonic devices. Since ultrasound is facing an ever-increasing use in many applications, by introducing the GraSonics concept, we envisage a profound impact on the field of high precision measurement and detection in various industries.