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RF/Bio MEMS transducers for microsystems-on-a-chip

This talk is going to present our recent efforts towards strategic design, advanced manufacturing and characterization of miniaturized devices for emerging RF/MW/Biomedical Microsystems. Firstly, this talk will discuss the design, fabrication and testing of high-frequency selectivity (high-Q) on-chip micro-resonators for wireless telemetry and sensor applications. The most recent progress in the area of high-Q micromechanical resonators will be presented, which outperform the current state-of-the-art QCM, SAW and BAW devices, thus enabling the next generation point-of-care and/or disposable biosensor applications. This talk will also review our ongoing efforts for implementation of chip-scale acoustic/optical sensing platforms by taking advantages of optical and acoustic resonances. The ability to integrate an array of miniaturized capacitive/piezoelectric micromachined ultrasonic transducers offers unique performance benefits thus enabling continuous monitoring or imaging. Secondly, this talk will discuss the fabrication and characterization of surface-attached microbeam arrays of that are made of a thermoresponsive polymer with embedded spherical or octopod Fe3O4 nanoparticles. Turning on and off an AC-magnetic field induces the microbeam array to expel or imbibe water due to the hydrophilic-to-hydrophobic transition, leading to a reversible transition from a buckled to non-buckled state. It is shown that the octopod nanoparticles have a heating rate of 30% greater (specific absorption rate) than that of the spherical nanoparticles, which shortens the response time of the polymer MEMS micro-actuators. It is further demonstrated that this shape transition can be used to propel 50ìm spherical objects along a surface. It holds the promise of harnessing shape-shifting patterns in microfluidics for manipulation of biological samples, which is crucial for microbiology, pharmaceutical science and related bioengineering fields.

Biography

Jing Wang is a Full Professor in the Department of Electrical Engineering at the University of South Florida, which he joined since 2006. He got dual BS degrees in Electrical Engineering and Mechanical Engineering from Tsinghua University in 1999. He received two MS degrees, one in electrical engineering, the other in mechanical engineering and a PhD degree from the University of Michigan in 2000, 2002, 2006, respectively. His research interests include micromachined transducers, RF/Bio-MEMS, lab-on-a-chip and microfluidics, functional nanomaterials, nanomanufacturing and RF/microwave devices. His work has been funded for more than $10M by research grants from federal agencies (NSF, DTRA, US Army, US Air Force, etc.) and contracts from more than a dozen companies. He has published more than 120 peer-reviewed papers and held 10 US patents. He serves as the chairperson for IEEE MTT/AP/EDS Florida West Coast Section and Director for the Wireless and Microwave Information (WAMI) Center. He has been elected as a member of the prestigious IEEE MTT-Technical Coordinating Committee on RF MEMS. He has chaired IEEE Wireless and Microwave Technology Conference (WAMICON) in the last a few years.

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