Fabrication of fully suspended pyrolytic carbon string resonators for characterization of drug nano- and microparticles

Pyrolytic carbon is a promising material for fabrication of micro- and nanomechanical sensors due to the possibility to control both structural parameters and properties such as resonance frequency, residual stress and electrical conductivity. Here, we present a novel fabrication process for pyrolytic carbon string resonators suspended over a through-wafer-orifice. The pyrolytic carbon string resonators had a length of 400 μm, a width of 30 μm and a thickness of 700 nm. The string resonators were applied for characterization of nano- and microparticulate drug formulations using two different modes of operation. First, mass-sensing on nanograms of nebulized or spray coated paracetamol micro- and nanoparticles was demonstrated. Then, absorption spectra of the drug were obtained by nanomechanical infrared spectroscopy (NAM-IR). Finally, an efficient method for in situ regeneration of the sensor was demonstrated.