Sensors and Materials, Vol. 22, No. 2 (2010) 71–83
MYU Tokyo

S & M 0790

Solid Internal Energy Dissipation of 3C Single-Crystal Silicon Carbide Micromechanical Resonators by Heterojunction Growth on Silicon

Wenteng Chang*

Deptartment of Electrical Engineering, National University of Kaohsiung,
No. 700, Kaohsiung University Road, Nan-Tzu District, Kaohsiung, Taiwan, 811

(Received March 4, 2009; accepted July 29, 2009)

Key words: resonator, silicon carbide, internal energy dissipation, heterojunction growth

A previous report shows that a 100-nm-thick free-free beam, single-crystal silicon carbide (SiC) resonator has quality factors 10 times lower than those made with a 10-μm-thick single-crystal SiC cantilever even though the free-free beam is supposed to have lower clamping loss.[1,2] This manuscript explores the above-mentioned difference using the heterojunction growth of (110) 3C-silicon carbide deposited as structural films of micromechanical resonators on single-crystal silicon and polycrystalline silicon. The polycrystalline SiC resonators with smaller clamping losses were fabricated to contrast with the resonators made of single-crystal SiC. The analysis showed that solid internal energy dissipation may play a more important role than the other losses operated in tens of kilohertz. The resonators with a 2-μm-thick single-crystal SiC having *Q*s between the previous reports may suggest a higher defect density near the interface, which causes high solid internal dissipation. Although an electrical measurement technique was used, the dominance of this material property appeared to be due to grain size instead of conductivity.

*Corresponding author: e-mail: wtchang@nuk.edu.tw