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Internal friction peak in silicon revealed by moderate temperature annealing[1] THOMAS METCALF, XIAO LIU, JEREMY ROBINSON, Naval Research Laboratory — In order to maximize of the quality factor of a mechanical resonator, one must minimize energy loss mechanisms. We have identified a new internal friction (IF) peak that is present in as-fabricated ultra-high Q silicon resonators known as Double Paddle Oscillators. The IF peak can be removed (and thus its presence revealed) by annealing at moderate (300 °C) temperatures in both inert (Argon) and reactive (H_2) atmospheres, and does not re-appear after aging for 10^7 s. The success of a relatively low temperature operation in eliminating this mechanism indicates that the phenomenon is surface-, as opposed to bulk- related. We compare this loss mechanism to other known loss mechanisms in silicon.

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