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**Improving the Quality Factor of Micromechanical Resonators with Surface Chemistry** DEBODHONYAA SENGUPTA, JOSHUA HENRY, YU WANG, MELISSA HINES, Department of Chemistry and Chemical Biology, Cornell University, Ithaca NY 14850 — The sensitivity of a micromechanical resonator to an applied force or mass is determined, in part, by the resonator's quality factor, or Q, which is a measure of mechanical energy dissipation. By changing a single monolayer of molecules on the surface of a 5-$\mu$m-wide, 250-nm-thick, MHz-range Si resonator - less than 0.07% of the total mass - the quality factor of the resonator can be improved by at least 70%. We report on experiments to determine the chemical origin of this effect and to improve the Q of silicon devices. Resonators terminated by a suitably prepared methyl monolayer have higher Q's and better stability than similar resonators coated with the best termination previously demonstrated - a single monolayer of H atoms. Equally importantly, our experiments show that surface-induced mechanical losses are relatively insensitive to the mechanical properties of the monolayer itself. Our working hypothesis for the chemical origins of this effect will be discussed.

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