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Electric field cancellation on quartz by Rb adsorbate-induced negative electron affinity¹

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We investigate the (0001) surface of single crystal quartz with a submonolayer of Rb adsorbates. Using Rydberg atom electromagnetically induced transparency, we investigate the electric fields resulting from Rb adsorbed on the quartz surface, and measure the activation energy of the Rb adsorbates. We show that the adsorbed Rb induces a negative electron affinity (NEA) on the quartz surface. The NEA surface allows low energy electrons to bind to the surface and cancel the electric field from the Rb adsorbates. Our results are important for integrating Rydberg atoms into hybrid quantum systems and the fundamental study of atom-surface interactions, as well as applications for electrons bound to a 2D surface.

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