Fabrication and photoluminescence characterization of carbon nanotube
dual-gate devices

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Photoluminescence from carbon nanotubes subjected to a DC gate voltage is quenched due
to induced carrier accumulation [1], whereas applying a square-wave gate voltage to
nanotubes causes luminescence recovery as a result of carriers being swept into contact
electrodes [2]. Here we characterize photoluminescence of carbon nanotubes in dual-gate
devices which allow for simultaneous and independent application of a DC gate voltage and a
square-wave gate voltage. The devices are fabricated from silicon-on-insulator substrates,
where trenches isolate two regions of the top silicon layer for use as the dual gates. We then
perform thermal oxidation to form a gate dielectric, and air-suspended carbon nanotubes are
grown over the trench between the dual gates. Photoluminescence measurements are used to
identify the chirality of the as-grown individual nanotubes, and we examine the response of
the nanotube emission to various combinations of the dual-gate voltages.

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