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Synthesis of vertically aligned single-walled carbon nanotubes and their anomalous Raman spectra

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We review our recent studies on the synthesis of vertically aligned single-walled carbon nanotube (VA-SWNT) films by chemical vapor deposition (CVD) of alcohol [1]. In particular, we look at how the ethanol pressure affects the growth process in real-time using an *in situ* optical absorbance measurement [2]. We find there is an optimum ethanol pressure that increases with CVD temperature, below which the growth is governed by a first-order reaction. The growth rate of the film is also found to be sensitive to changes in the growth environment, and can change on short time scales. We also report preliminary results from polarized Raman spectroscopic studies that show anomalous anisotropic behavior in the radial breathing mode. A possible connection between this anisotropy and the small-bundle structure of the VA-SWNT films [3] is discussed.

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Boson-controlled quantum transport in electronically low-dimensional materials

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The interplay of collective dynamics and damping in the presence of correlations and bosonic fluctuations is studied within the framework of a newly proposed model, which captures the principal transport mechanisms that apply to a variety of physical systems. The close connections to the transport of lattice and spin polarons, or the dynamics of a particle coupled to a bath are established. The model is analysed in the one-particle sector by exactly calculating the optical conductivity, Drude weight, inverse photoemission spectra, quasiparticle mass and band dispersion, as well as particle-boson correlation functions, for finite and infinite one-dimensional