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Quantum simulation of four-probe measurement of carbon nanotube[1] ASAKO TERASAWA, KEIJI TOBIMATSU, TOMOFUMI TADA, SATOSHI WATANABE, KEIJI TOBIMATSU, Dept. of Materials Engineering, The Univ. of Tokyo — The four-probe method is widely used to measure the intrinsic resistance of various materials without the effects of sample-probe contacts. Recently, there have been many attempts to apply this method to nanoscale objects. Also, anomalous behaviors of nanoscale four-probe measurements were reported such as the negative four-probe resistance of single-walled carbon nanotube. To investigate quantum effects on the four-probe measurements in nanoscale, we examined the four-probe resistance of (5,5)-carbon nanotube with a vacancy or without a vacancy theoretically on the basis of density functional tight-binding method and Green's function method. We found that the calculated four-probe resistance is sensitive to the position of the vacancy relative to the probes even when the sample-probe connections are weak. Such a behavior is unlikely to be seen in the two-probe resistance, and suggests that the four-probe resistance of nanoscale systems depend on the sample-probe geometry in a complicated manner.

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