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Among manifold features of one-dimensional nanomaterial, namely, single-walled carbon nanotubes (SWNT), their electrical characteristics provide a method of choice in order to interface and uncover processes that are as disparate as biological recognitions. Interfacing electrical characteristics of SWNT in order to monitor intricate carbohydrate-protein interactions forms the basis of present study. Mannose coated poly(ether imine) (PETIM) dendrimers undergo charge-transfer interactions with SWNT, so as to form SWNT-dendrimer complex. Upon characterization, multivalent dendritic sugar functionalized SWNT was subjected to lectin interactions, particularly with mannose-specific and non-specific lectins, namely, concanavalin A (Con A) and pea nut agglutinin (PNA), respectively. Changes in the conductance of the device made of dendritic sugar functionalized SWNT, after addition of lectins in varying concentrations were found to follow the Langmuir type isotherm. Almost 30 times increase in the device characteristics was observed for the specific interaction of Con A with functionalized SWNT, with lectin concentration of 1 nM, in comparison to interaction with PNA. The specificity of sugar-lectin interactions was characterized further by observing significant shifts in Raman spectral modes.