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# Improving single carbon nanotube electrode contacts using molecular electronics

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Carbon nanotubes (CNTs) and their derivatives are commonly applied as both catalyst supports and catalysts in many electronic devices. To achieve high-performance electronics, researchers have focused intensive efforts into developing the chemical and physical properties of new materials but largely ignore the potentially fundamental problem of forming a high-quality contact with the electrochemical substrate. When two materials are brought into contact, the junction causes a potential drop in the system resulting from a contact resistance. To understand the junction properties of metal/CNT interfaces, the nano-impact methodology has been developed as a route to measuring the resistance across individual CNT–electrode contacts. In these experiments, some of the CNTs in the solution phase form a bridge across two adjacent gold electrode contacts. An average bridging resistance for individual CNTs contact is 1.1±0.1×108 Ω. To improve the CNT-Au contact, we report the use of an electroactive species, acetaminophen, to modify the electrical connection between a carbon nanotube (CNT) and an electrode. By measuring the current signal across the bridge of single acetaminophen-modified CNT contact between the two microbands of the IDE-Au, the current response of acetaminophen modified on CNT is significant higher than the bare CNT, indicating that the electronic properties of the single CNT-Au contact are improved by modifying CNT with acetaminophen. It investigates that the adsorbed acetaminophen molecules contribute to promoting the electron transfer processes between the junctions of two materials.

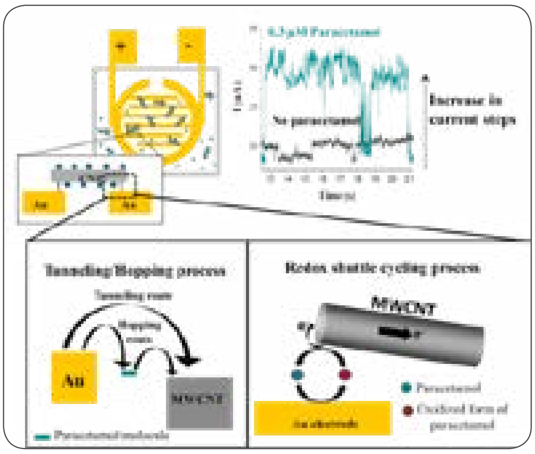


**Figure 1:** Schematic shows an opportunity of the improvement of Faradaic electron transfer process between acetaminophen modified CNTs and two adjacent gold electrode contacts

## Recent Publications:

1. Krittayavathananon A, Li X, Batchelor McAuley C, Kätelhön E, Chaisiwamongkhol K, Sawangphruk M and Compton R G (2017) Improving single-carbon nanotube-electrode contacts using molecular electronics. The Journal of Physical Chemistry Letters 8:3908–3911.
2. Proctor S J and Linholm L W (1982) A direct measurement of interfacial contact resistance. IEEE Electron Device Letters 3:294-296.
3. Li X, Batchelor McAuley C, Shao L, Sokolov S, Young N and Compton R G (2017) Quantifying single-carbon nanotube-electrode contact via the nanoimpact method. The Journal of Physical Chemistry Letters 8:507-511.
4. Sokolov S, Eloul S, Kätelhön E, Batchelor McAuley C and Compton R G (2017) Electrode-particle impacts: a user's guide. Physical Chemistry Chemical Physics 19:28-43.
5. Krittayavathananon A, Li X, Sokolov S V, Batchelor McAuley C, Sawangphruk M and Compton R G (2018) The solution phase aggregation of graphene nanoplates. Applied Materials Today 10:122-126

## Biography

Atiweena Krittayavathananon PhD has her expertise in Applied Electrochemistry, Electro-Analysis and Functional Materials. After years of experience in the research, she found new pathways for observing aggregation of 2D materials in colloids and suspensions using an electrochemical “nano-impacts” based on bridging impacts. The “nano-impacts” has proved to be an effective approach for investigating single nanoparticle behavior in solution phase. By using this technique, she creates a simple idea for minimizing contact resistance between catalysts and supporting electrode in the solution phase as presented in her talk

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