Single Protein Transistors

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The operation of a single-protein transistor is demonstrated using the Break Junction Scanning Probe Microscopy approach.[1-3] Molecules are detected as plateaus in current distance tunnelling traces and conductance can be obtained and studied quantitatively under electrochemical control.[2]
Pseudomonas aeruginosa Az is a globular protein that contains a Cu ion coordinated by protein residues, which makes the protein capable of accepting and transporting electrons by switching its redox state ($Cu^{I/II}$). This redox protein is an ideal candidate for the design of bioelectronic devices, as previously reported.[4, 5]
Using molecular juntions approach we studied azurin conductance at single molecule level in electrochemical conditons. As expected, conductance depends on potentials applied in the system.[6] This dependence is consistent with a redox gated electron transfer mechanism, such as the two step electron transfer[7] previously described for azurin.[5, 7] Redox gating of the protein with an on/off ratio of 20 is demonstrated and constitutes a proof-of-principle of a single redox protein field effect transistor. The joint figure shows a scheme of the experimental setup together with results characterizing the transistor properties of this particular device. These results confirm azurin as a single molecule transistor and open new perspectives for the design of novel molecular and bioelectronic devices.[6]

References

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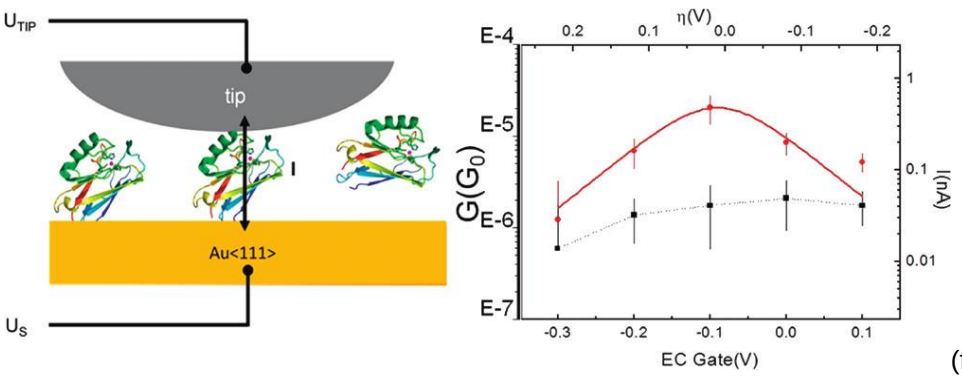
Figure



(from 6)