Graphene nanoribbon based electronic devices

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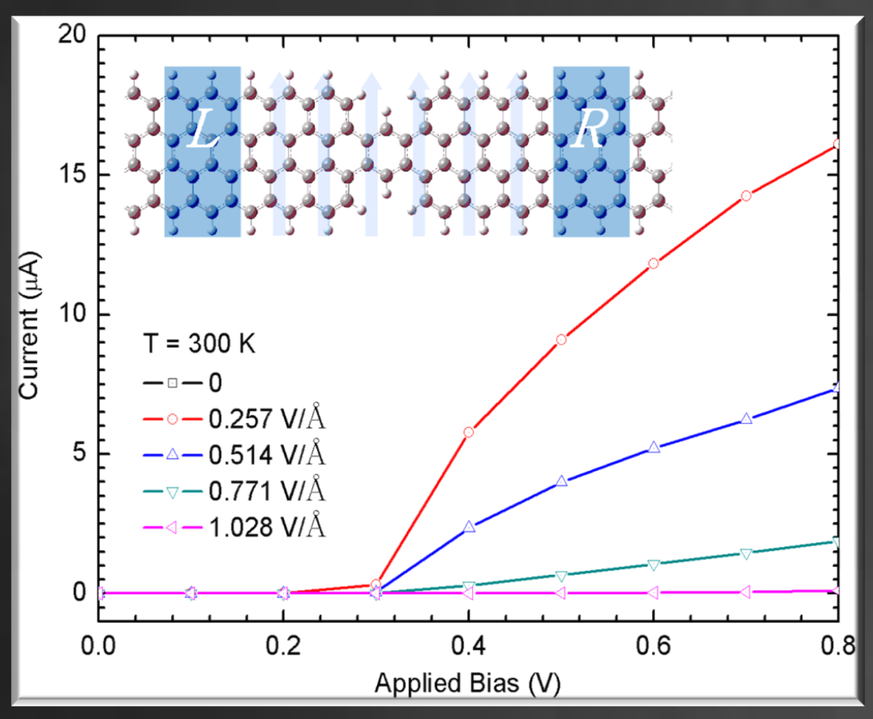
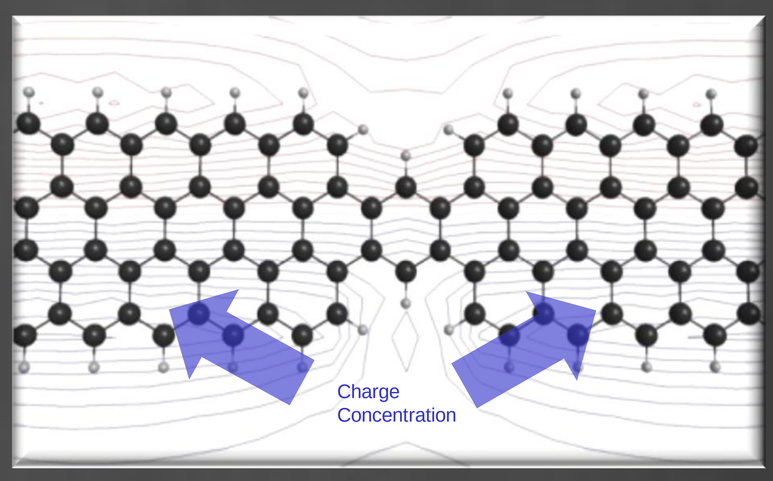
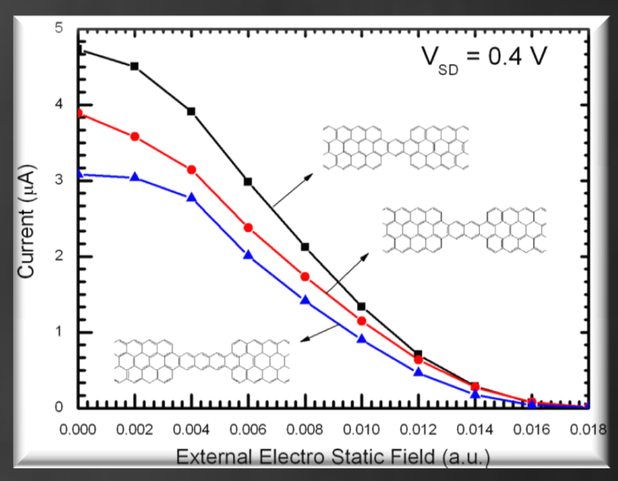
Graphene, as the "hot spot" of recent theoretical and experimental research, is an attractive kind of candidate material for future nano-electronic devices. Cutting it in narrow ribbons is a well-accepted method to open a gap to control the transport behavior of carriers. graphene nanoribbons have delocalized molecular orbital, which is very sensitive to external electronic fields. With particular chosen nano-structure, a scattering region coupled to source and drain electrodes can be applied as electronic switches and transistors with extremely small scales.

Edge-defect junction: nano-switch scenario

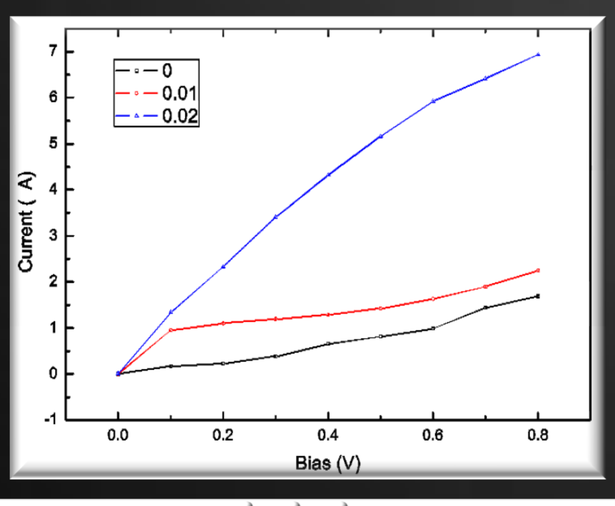
With widely applied NEGF-DFT method, Our simulation indicates that, tunneling current of ZGNRs with edge defects can be tuned sensitively by the external electronic field.

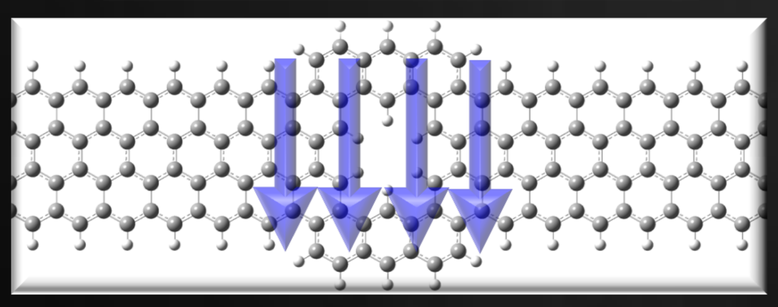




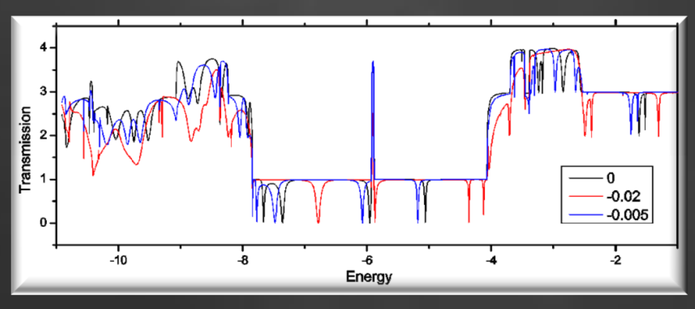


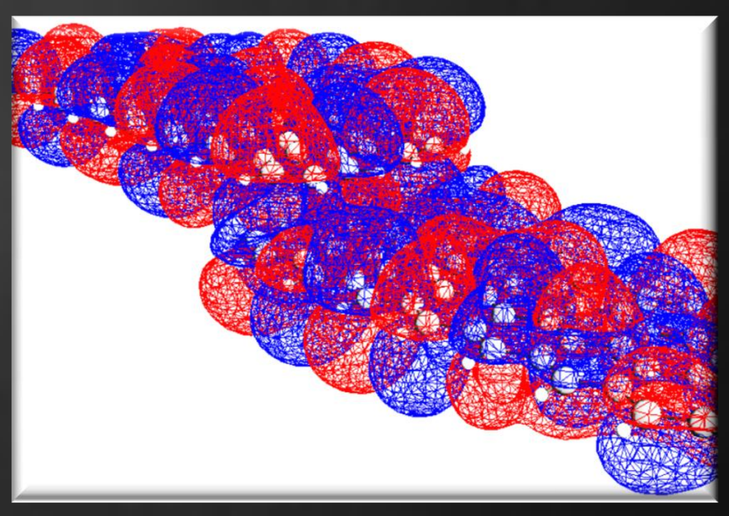
Nano-transistor: graphene ring between ZGNR source and drain electrodes

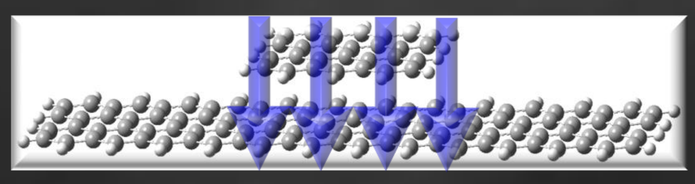


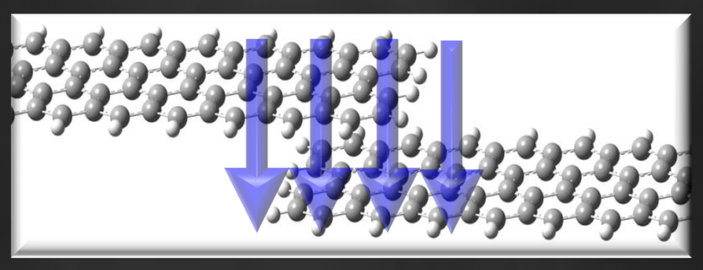


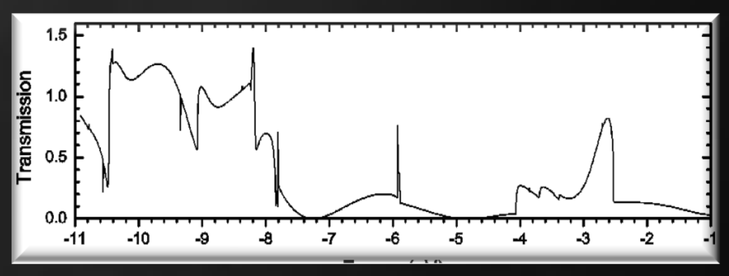
Double Layers: easy control of transmission spectrum





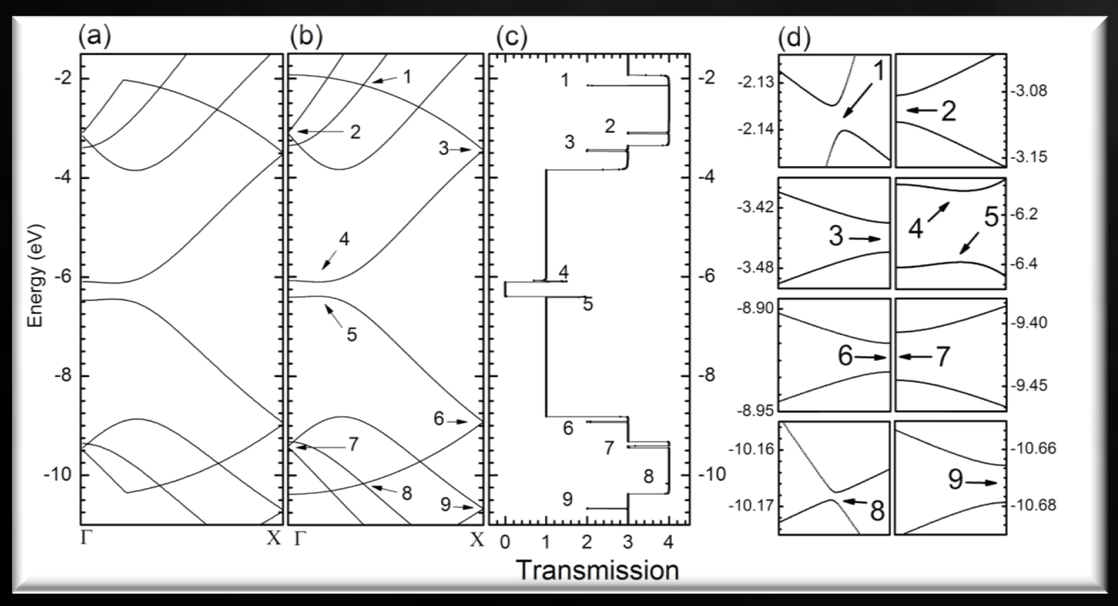




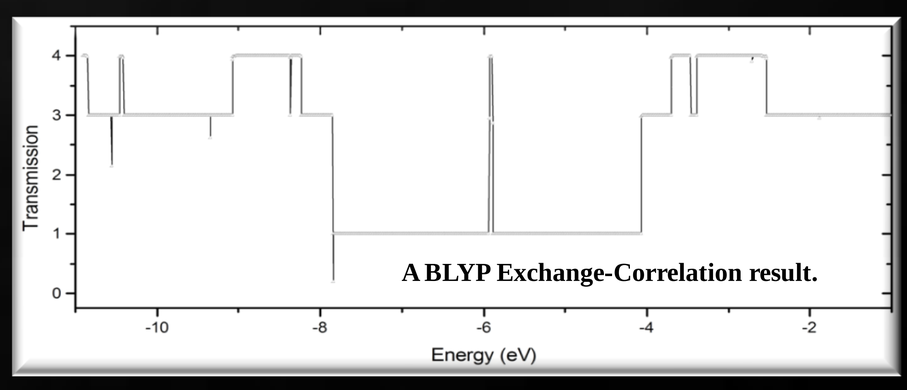


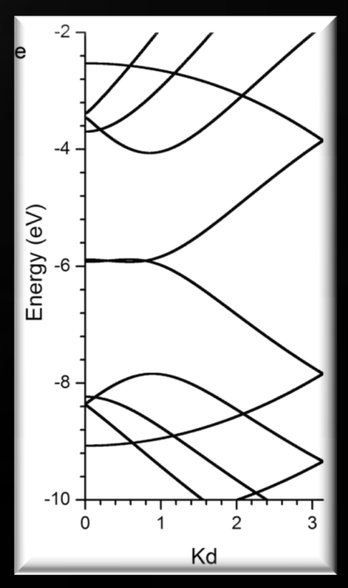
Because of strong inter-layer coupling, external field can also control the transmission of double layer devices.

Relationship between the band structure of leads and the transmission spectrum



"Bad points" of step shaped transmission spectrum: mini band gaps.





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