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Charge and spin transport across graphene and multifunctional oxide interfaces

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Propositions

accompanying the dissertation

Charge and spin transport across graphene and multifunctional oxide interfaces:

Towards energy efficient logic and memory devices

1. *“One who stays near vermilion gets stained red, and one who stays near ink gets stained black.”* – Xuan Fu Graphene, a two-dimensional material, is particularly sensitive to its surroundings. Multifunctional oxides can enrich graphene with various functionalities. [Chapter 5, 6, 7]
2. Material tunability is a key parameter for device applications. The tunability of spin transport parameters in graphene on complex oxides [Chapter 5, 8] and the tunability of the magnetic order in BiFeO_3 by strain, [Chapter 7] make these systems promising for spintronics applications.
3. Misfortune may be a blessing in disguise. Defects, such as oxygen vacancies, are normally considered as adversities in material performance. By changing our perspectives we can explore such adversities. Specifically, the dynamics of oxygen vacancies can be utilized in memristive platforms. [Chapter 6]
4. External factors, such as strain and temperature, can easily disturb the delicate balance between competing degrees of freedom (lattice, charge, orbit and spin) in strongly correlated oxides and lead to a different phase. [Chapter 6, 7]
5. The ultimate truth lies in ultimate simplicity. The simplicity in the structure of graphene makes it a perfect model to explore the fundamentals of physics.
6. Life keeps changing like a river keeps flowing. Change is an unavoidable constant in life. COVID 19 has taught us a good lesson about impermanence.
7. *“To learn without thinking is blindness, to think without learning is idleness.”* The wisdom of Confucius can be applied to research. To do experiments without thinking is blindness, to think without experiment is idleness.
8. *“Everything harmonizes with me, which is harmonious to thee, o Universe. Nothing for me is too early or too late, which is in due time for thee.”* – Marcus Aurelius Everything in the universe happens in a certain sequence. We should live in the present, without regrets for the past and worries for the future.

Si Chen