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Charge transfer and emergent phenomena of oxide heterostructures[1]

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Charge transfer is a common phenomenon at oxide interfaces. We use first-principles calculations to show that via heterostructuring of transition metal oxides, the electronegativity difference between two dissimilar transition metal ions can lead to high level of charge transfer and induce substantial redistribution of electrons and ions. Notable examples include i) enhancing correlation effects and inducing a metal-insulator transition [1]; ii) tailoring magnetic structures and inducing interfacial ferromagnetism [2]; iii) engineering orbital splitting and inducing a non-cuprate single-orbital Fermi surface [3]. Utilizing charge transfer to induce emergent electronic/magnetic/orbital properties at oxide interfaces is a robust approach. Combining charge transfer with quantum confinement and expitaxial strain provides an appealing prospect of engineering electronic structure of artificial oxide heterostructures. [1] H. Chen, A. J. Millis and C. A. Marianetti, PRL 111, 116403 (2013) [2] H. Chen, H. Park, A. J. Millis and C. A. Marianetti, PRB 90, 245138 (2014) [3] H. Chen, D. P. Kumah, A. S. Disa, F. J. Walker, C. H. Ahn, and S. Ismail-Beigi, PRL 110, 186402 (2013)

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