The Alchemy of Vacuum
- Hybridizing Light and Matter -

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Strong coupling of light and matter can give rise to a multitude of exciting physical effects through the formation of hybrid light-matter states. When molecular materials with high transition dipole moments are placed in the confined fields of metallic microcavities or surface plasmons, Rabi splittings approaching 1 eV are observed due to the interaction with the vacuum electromagnetic field. This leads to fundamental changes in the properties of the coupled system, especially in the ultra-strong coupling regime. While strong coupling has been extensively studied due to the potential it offers in physics such as room temperature polariton condensates and thresholdless lasers, the implications for molecular and material science have remained mostly unexplored. After introducing the fundamental concepts, examples of modified properties of strongly coupled systems, such as chemical reactivity and charge and energy transport, will be given to illustrate the potential of light-matter states.[1-8]

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