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Chemistry Perspectives to Novel Quantum Materials

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Design and discovery of new quantum materials will accelerate the development of new technologies in the future. I will report my group research progress in the past year, mainly focusing on the new superconductors and new magnetic topological quantum materials. Superconductors are naturally an ideal platform for quantum information processing (QIP), as they realize electrons to be entangled by forming cooper pairs. My group recently discovered several new superconductors. I will explain our interpretation of this work. More importantly, we are trying to use chemical bonding concept to predict the existence of superconductivity in the materials.

Magnetic topological quantum materials (MTQMs) can give rise to forefront electronic properties such as the quantum anomalous Hall effect, axion electrodynamics and Majorana fermions. In our group, we used chemistry electron count rules and structure-property relationship to design new MTQMs. I will describe how to design and prove the material candidate as a new MTQM from both experimental and theoretical aspects and show how topological electronic states and magnetism interplay in the new material.