$SrTiO_3$: A photocathode quantum material

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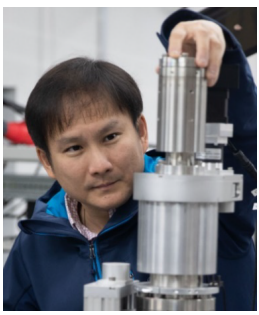
Photocathodes—materials that convert photons into electrons through the photoelectric effect—are important for many modern technologies that rely on light detection or electron-beam generation. However, it is becoming increasingly difficult for the existing photocathode materials to meet the performance requirements of cutting-edge technology upgrades. These materials and the underlying theory of their photoemission properties were established more than 60 years ago. Lack of innovations in the development of both new materials and new theories has been the bottleneck for the advancement of the photocathode field. Here I show how this century-old field could be transformed dramatically through the introduction of a quantum material to obtain a quantum leap in photocathode performance. This performance boost is driven by the surprising emergence of coherence in secondary photoemission we observed from the $SrTiO_3$ photocathode that defies explanation based on existing theories. $SrTiO_3$ thus represents a fundamentally new class of photocathode quantum materials, opening new prospects for applications that require intense coherent electron beams without the need for monochromatic excitations.



Short Bio:

Rui-Hua He is a tenured full professor in Physics of Westlake University. He obtained a PhD degree from Stanford University in 2010. He worked as a postdoctoral fellow in Lawrence Berkeley National Lab and as an assistant professor in Boston College prior to joining Westlake University in 2017. He is a recipient of the US NSF CAREER Award in 2015.