

# **Copper-based chalcogenide compound semiconductors:**

## **New materials for photovoltaics**

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We are facing serious challenges in energy and environment in the 21<sup>st</sup> century. Photovoltaic solar electricity as a mature technology is a perfect solution to help us to resolve these challenges. The successful deployment of solar electricity will not only overcome the energy and environment crisis but also sustain a healthy economic and civilizational development.

In photovoltaic technology, cost is the most important issue that impedes its global-scale application today. In this talk, I will present two copper-based chalcogenide compound semiconductors, the well-known  $\text{CuInGaSe}_2$  (CIGS) and the emerging  $\text{Cu}_2\text{ZnSnS}_4$  (CZTS), as photovoltaic absorber materials that can reduce production cost. Through the discussion on their crystal structures, electronic properties of grain and grain boundary, and device structure and fabrication, I will demonstrate the advantages for their adaption in photovoltaic application. While already successful, the current challenges faced by the CIGS technology and its large-scale application will be addressed. The present status and the challenges for the emerging CZTS will also be discussed. In the end, I will report our progress in synthesizing these two materials for photovoltaic device fabrications. The China elements, in research, in industrialization, and in application, will also be discussed.