

Chemical Bond Imaging: Decoding the Chemistry Using Molecular Fingerprints

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Abstract

Chemical microscopy using intrinsic fingerprint spectroscopic signals from molecular vibrations opens a new window for understanding life at the molecular level and enables molecule-based diagnosis and treatment of diseases. Yet, the vibrational signals from chemical bonds is weaker than the fluorescence signal from a dye by many orders of magnitude. Detecting such weak signal from a tight focus (i.e., a small volume of ~ 1 femtoliter) under a microscope is extremely challenging and was considered nearly impossible. Ji-Xin Cheng devoted his career to overcoming such daunting barrier through developing advanced chemical microscopes over the past 25 years. In this lecture, Cheng will tell his journey of serendipity-driven innovation, biomarker discovery, clinical translation, and entrepreneurship in the growing field of chemical imaging.

Related Reviews

Ji-Xin Cheng*, Sunney X. Xie*, “Vibrational spectroscopic imaging of living systems: an emerging platform for biology and medicine”, *Science*, review, 2015, 350: aaa8870.

Ji-Xin Cheng, Yuhao Yuan, Hongli Ni, Jianpeng Ao, Qing Xia, Rylie Bolarinho, Xiaowei Ge, Advanced vibrational microscopes for life science, *Nature Methods*, 2025, 22, 912-927.