Electron Transport through Hydrogen Bonded Single-Molecule Junctions

Jiu-Hong Fang\textsuperscript{1}, Zhi-Hao Zhao\textsuperscript{2}, Ang-Xuan Li\textsuperscript{1}, and Lin Wang\textsuperscript{1}

\textsuperscript{1}China University of Geosciences Beijing
\textsuperscript{2}Northwestern Polytechnical University

May 29, 2023

Abstract

Hydrogen bonding is a vital driving force for organizing the hierarchy molecular structure, especially in biologic field. Due to its directionality, selectivity and moderate strength, hydrogen bonding has been extensively introduced into the molecular recognition, sensing and electronic devices. Electric measurements at single-molecule level facilitate the investigation of hydrogen bonds and provide a comprehensive understanding of the electron transport properties governed by the hydrogen bonding, which is essential for the development of self-assembled electronic systems. This review provides a detailed overview of recent advancements in constructing single-molecule junctions utilizing intramolecular and intermolecular hydrogen bonding. We first introduce the methods utilized for characterizing the electric and dynamic properties of non-covalent interactions. Next, we discuss the mechanisms of electron transport, relevant influencing factors, and typical applications utilizing electrical signals based on single-molecule junctions. Finally, we propose our perspective on the existing challenges and prospective opportunities in utilizing hydrogen bonding for electronic device applications.

Hosted file