Metal diatomic molecule with multiple bonds

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Background

The multiple bonds between metal atoms relate to the most basic chemical nature of the relevant countless molecules and reactions. All the stories start with a paper published by F. A. Cotton in 1964 discussing the Re–Re quadruple bond in $[Re_2X_8]^{2-}$ and presenting a systemic and rational exploration of metal–metal bonding across the transition series[1]. Although hundreds of molecules containing metal–metal core have been discovered since then, they are all stabilized by big ligands[2-4]. These molecules are studied as bulk crystals or in solution without exception for investigating the molecular structure, bond length and bond order[5,6].

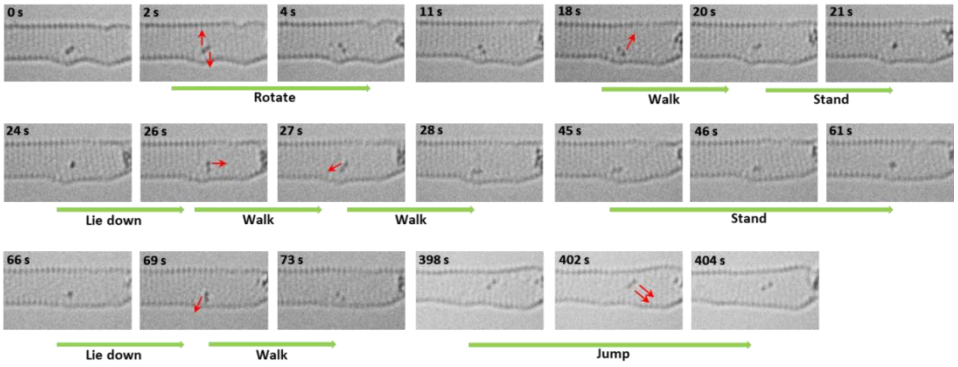

Figure 1. Time series of the dynamic of the Re dimer showing different kinds of motions under electron beaming irradiation.

Aim

In this study several kinds of metal diatomic molecules (Re_2, W_2, *etc.*) are inset into single walled carbon nanotubes (SWNT) and investigated by the aberration corrected transmission electron microscopy with atomic resolution. It is interesting and meaningful to understand the motion of the diatomic molecule under e-beam irradiation (Figure 1).

Workplan

- Track the trajectories of metal diatomic molecules' movement in the SWNT.
- Measure the velocity of the metal diatomic molecule.
- Measure the length of the ever-changing multiple bonds between metal atoms.
- Evaluate the bonding state of the diatomic molecule.

Requirements

- Good understanding in physics and chemistry.
- Interest in programming and in experimental work on the TEM.
- Strong motivation to work in our team.

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