Scientists peer into the nanoverse

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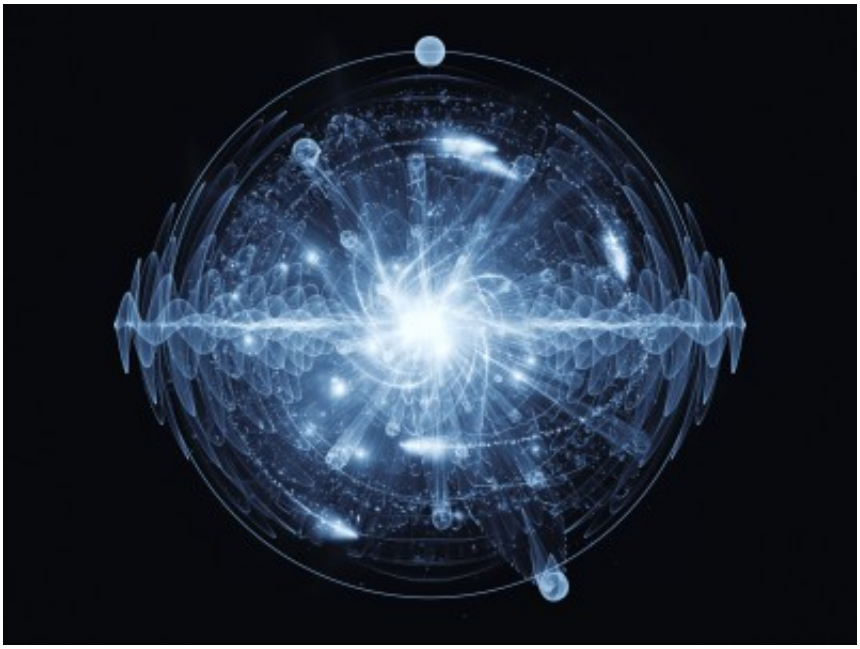

Using state of the art technology, researchers at the Monash Centre for Electron Microscopy (MCEM) have developed new methods which allow tiny displacements of atoms to be witnessed and measured.

The research, published in the latest edition of prestigious journal *Nature Materials*, provides immediate insights into lithium-ion battery performance and far-reaching implications for the design of new materials for energy generation and storage, next gen computing, green technologies, and other areas.

"The Monash research is like doctors being able to "see" behaviours of individual viruses rather than just imagining them by observing the symptoms. We can study atomic behaviour with picometre precision. To put this in perspective, a hydrogen atom has an estimated diameter of ~50 picometres," lead research author Dr. Ye Zhu said.

By manipulating these atomic displacements, researchers have the potential to create 'wonder materials' for use in applications such as high performance computers, ultra-efficient solar cells and environmentally friendly sensors.

"Atoms are the building blocks of nature. If the position of these building blocks is varied, even slightly, the impact on the function of a material can be profound," said corresponding author, Professor Joanne Etheridge, Director of MCEM. "This new method, combined with MCEM's powerful electron microscopes, has unveiled exquisitely subtle variations in the arrangement of atoms that drive the important properties of this material."

Researchers believe that the imaging method should be equally applicable to a variety of material systems and will become a popular and powerful tool in providing real-space structure information.

"This paper reveals the extraordinary power of modern electron microscopy to directly map the fine details of complex crystal structure, in this case that of a remarkable self-assembled nanostructure with a compositionally tuneable nano-scale periodicity," co-author Professor Ray Withers of ANU said.

More information: Direct mapping of Li-enabled octahedral tilt ordering and associated strain in nanostructured perovskites, *Nature Materials* (2015) DOI: 10.1038/nmat4390

Provided by Monash University