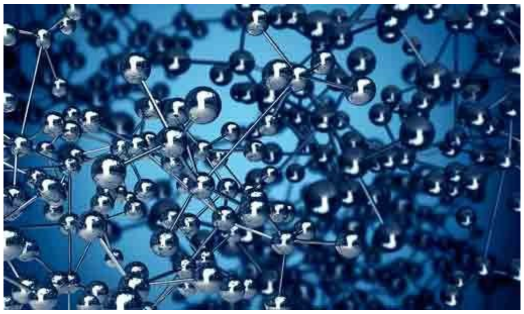
TECHNOLOGY SUMMARY

Water based Ion Trap for Quantum Computing



Water molecules to trap ions

Reference

10169

Patent status

US Patent Pending

Stage of development

Received highly competitive federal funding of $250K

Partnership with Oak Ridge National Laboratory, USA for device fabrication & characterization

Successful simulation results

Ongoing research

Contact

Scott Inwood
Director of Commercialization
Waterloo Commercialization Office
519-888-4567, ext. 43728
sinwood@uwaterloo.ca
uwaterloo.ca/research

Background

During the last few decades, different techniques have been developed for building the main component of quantum computers, i.e. quantum bits (qubits), including superconducting loops, spin-based quantum dots, coupled quantum wire and diamond vacancies to name a few.

Trapped Ions (TI) devices are leading candidates for building qubits for quantum computing. Existing methods of creating TI require designing/manufacture complex micro/nano fabricated devices and extensive use of laser sources to cool down ions and entrap them. These methods are typically very expensive and are not easily scalable for harnessing a large quantity of trapped ions.

A scalable method/device for creating TI could enable utilization of multiple qubits to perform necessary computational tasks, propelling the pursuit of practical quantum computation.

Description of the invention

Inspired by the transport of water molecules in naturally occurring proteins, researchers at the University of Waterloo have invented a novel, simple, and low-cost method to trap ions inside artificial water channels. This new method circumvents the need of using bulky lasers and expensive micro-nano fabrication techniques, thereby creating an unparallel potential of a scalable multi-qubit system.

Advantages

- Improved gate fidelity and long coherence for stable qubits
- Interaction of trapped ions with multiple neighbors enabling multi-qubit operations
- Simple design, low-power consumption, and lightweight
- Scalable architecture with full connectivity among qubits

Potential applications

The proposed device/platform can potentially be used in:

- quantum computers
- quantum information
- quantum sensing