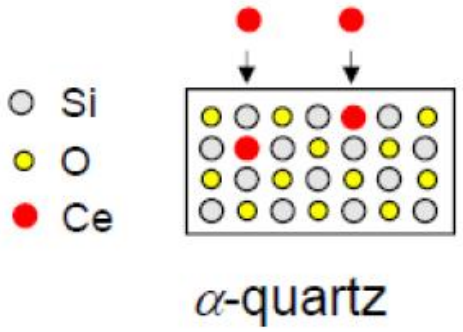
Tohoku Univ. Technology

# Quantum bit / Quantum sensor material using $SiO_2$

**Can be produced at low cost.**

**Proven write operation.**



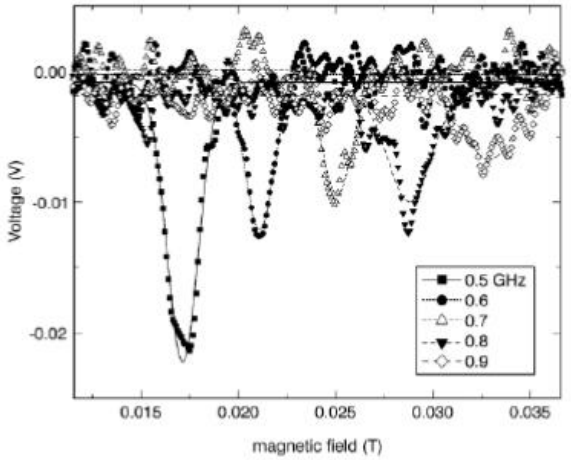

Schematic diagram of Ce ion doping into $SiO_2$ substrate

## Overview

Nitrogen-vacancy center (NV center) in diamond satisfies the characteristics required for qubits, and expected to be applied to quantum computers and quantum sensors. Other candidate materials are divacancy centers (VV centers) in SiC and Ce-implanted Yttrium Aluminum Garnet (YAG). However, the problem with all of these materials is the high cost of raw materials, and it is expected to be difficult to scale up.

The present invention demonstrates that light emitting centers ($Ce^{3+}$) can be formed in Ce implanted $SiO_2$ or $MgAl_2O_4$ substrates. Optically Detected Magnetic Resonance (ODMR) measurements demonstrate the feasibility of write operations in quantum dots. It is possible to realize a quantum bit / quantum sensor at low cost.

## Write operations in quantum dots




ODMR measurement results

## Product Application

- Quantum sensors such as ODMR
- Quantum bits for quantum computers

## Related Works

[1] Manato Kawahara et al, Applied Physics Express **17**, 072004 (2024)
https://doi.org/10.35848/1882-0786/ad59f4

## IP Data

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|---|---|---|
| IP No. | : | WO 20252/047531 A1 |
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