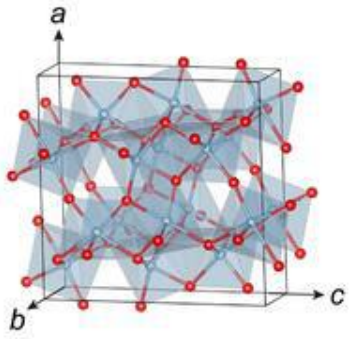
Tohoku Univ. Technology

λ-Ti_3O_5 thin film

Relatively easy production, large surface area (over 5x5mm^2), stable phase transition



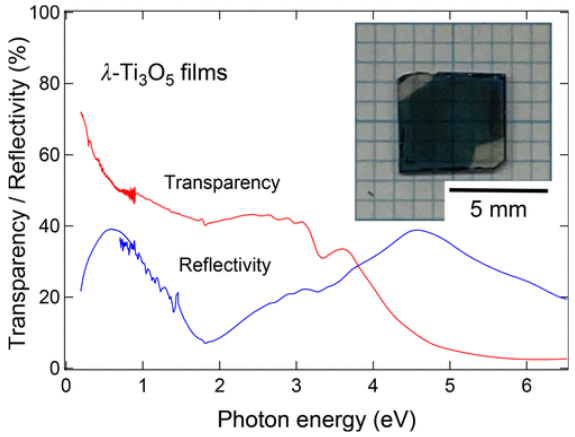
Schematic crystal structure of λ-Ti_3O_5 drawn by VESTA

Overview

λ-Ti_3O_5 is the unique oxide material that shows a photo-induced phase transition by visible-light irradiation. It is expected for application for optical recording media such as CD, DVD, and BD because of its low environmental impact compared to conventional chalcogenide materials. However, the crystal size of λ-Ti_3O_5 is limited to nanometer scale because of its metastable nature. This invention enables λ-Ti_3O_5 thin films with large surface area (over 5x5mm) using pulsed-laser deposition (PLD) method with TiO_2 as a raw material.

In a conventional method, λ-Ti_3O_5 could not be fabricated directly on substrates and an intermediate seed layer was required so that the seed layer component diffuses into λ-Ti_3O_5, which hindered the phase transition. On the other hand, this invention can synthesize λ-Ti_3O_5 thin films directly on a substrate without the seed layer, and thus the λ-Ti_3O_5 thin films show a stable phase transition.

Features・Outstandings



Optical spectra of the λ-Ti_3O_5 films. The inset shows the photograph of the films. The films are not deposited at the top-left and bottom right sides because the cramps cover the surface of the substrates during film deposition.

Product Application

- Application for optical recording media due to the photo-induced phase transition with visible-light irradiation
- Switching device, sensor, and memory that can detect light, pressure, and heat
- Heat storage material that can preserve the thermal energy absorbed across the phase transition for a long time and can release it when needed by applying pressure

Related Works

[1] Cryst. Growth Des. 2022, 22, 1, 703–710

IP Data

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