

Fabrication of calcite-coated rough-surface titanium using calcium nitrate

Sample Preparation

Commercial pure Ti (bare Ti) plates squares with were used as the coating substrates. $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ was dissolved in 99.5% ethanol (EtOH) to obtain 0.5, 1.0, and 2.0 mol/L $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ -EtOH solution as the Ca source.

Acid etching is performed on the Ti plate and then washed in ethanol (70%) with ultrasonic treatment for 5 min and then washed in distilled water with ultrasonic treatment for 5 min. After washing, Etched Ti was dried at RT.

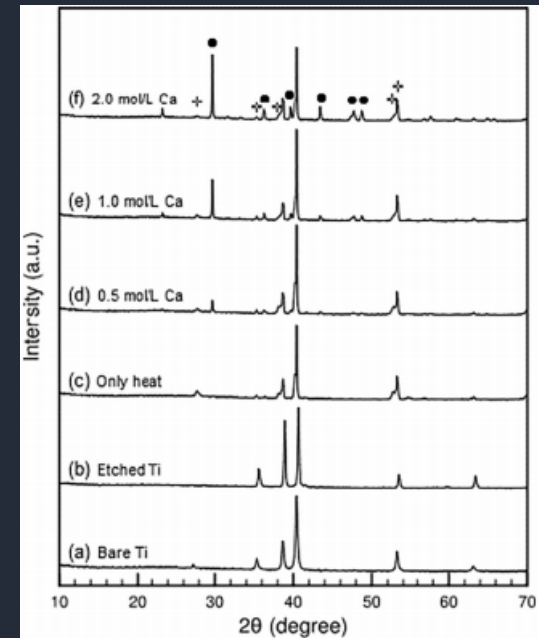
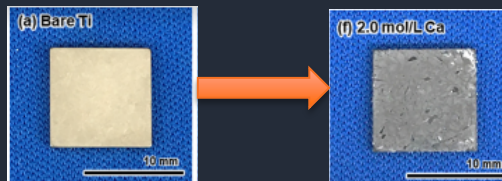
For the heated treatment for caronation, 5 μL of 0.5–2.0 mol/L $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ -EtOH solutions were dropped onto the of Etched Ti and evaporated to obtain precipitate on the Etched Ti surface.

After the treatment by the $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ -EtOH solutions, Etched Ti and a control sample of Et Ti without treatment were placed into an electricf urnace with a modified step controller and heated from RT to 550 °C at 3 °C/min and then maintained like that for 5 h with a CO_2 gas flow of 100 mL/min. Subsequently, the samples were cooled down inside the furnace.

Analytical Results

The intensity of the calcite peaks increased by increasing the concentration of the $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ -EtOH treatment solutions. In addition, after the heating, the peaks of TiO_2 phases (i.e., rutile and anatase) appeared.

In conclusion, XRD demonstrate that a calcite coating is formed on the Ti scaffold after the heat carbonation treatment using calcium nitrate solution.



Normal XRD pattern of bare Ti (a), Etched Ti (b), Etched Ti with heating, without a $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ solution (c), with 0.5 mol/L $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ solution (d), with 1.0 mol/L $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ solution (e), and with 2.0 mol/L $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ (f). •: calcite, +: TiO_2 (rutile and anatase).