Tenth International Conference on Flow Dynamics,
(November 25-27,2013 Sendai International Center)

Fabrication and OSC Property of Oriented Fe-based Complex Oxide Grains by Microwave Irradiation

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Introduction

- **Exhaust Emission**

Three Way Catalyst (TWC)

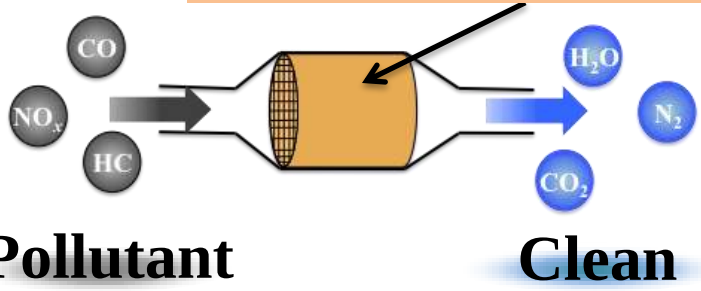


Fig.1 Scheme of three way catalyst

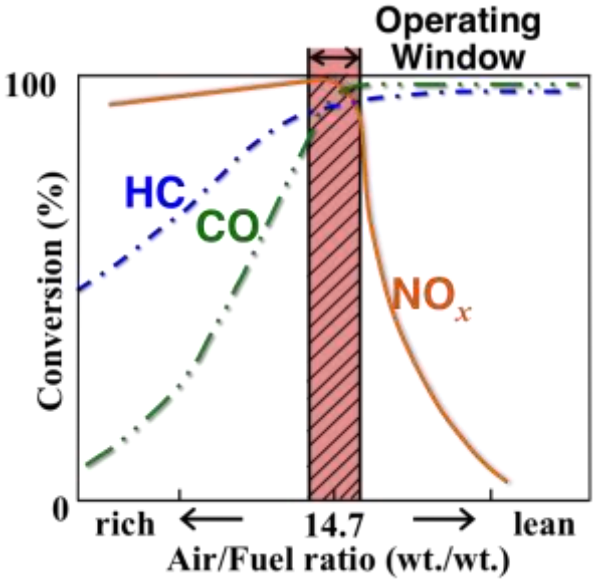


Fig.2 Conversion of three components

In TWC, promoters play important roles that suppress the oxidative–reductive compositional fluctuation in exhaust emission.

CeO_2-ZrO_2 solid solution are widely used

problem **Scarce** **Expensive**
Low property at low temp.

Rare earth free OSC materials are required

Promoter

OSC : Oxygen Storage Capacity

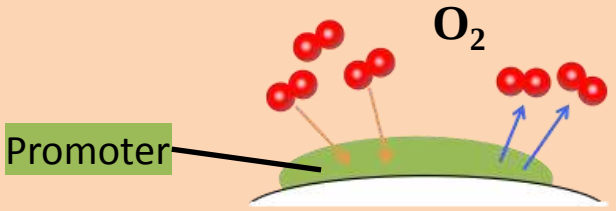


Fig.3 Scheme of promoter

Promoters storage and release oxygen reversibly

Introduction

- **Delafossite-type $CuFeO_2$**

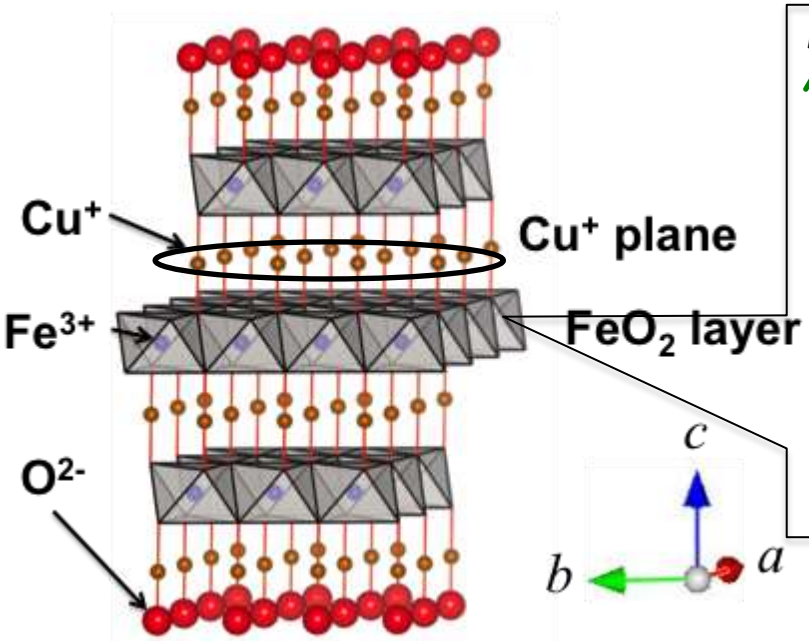
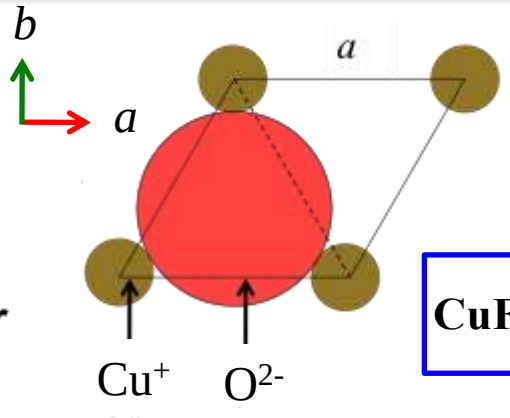


Fig.4 Crystal structure of $CuFeO_2$



Oxide ion is placed at center of Cu^+ triangular

$$CuFeO_2 + \frac{\delta}{2}O_2 \rightarrow CuFeO_{2+\delta}$$

Fig.5 Placement of intercalated oxide ion

- **Microwave heating process**

Internally heated

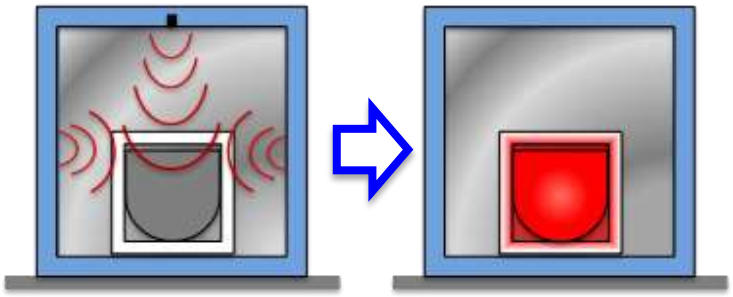


Fig.6 Scheme of microwave heating

Advantages

- Short time and low temperature processing
- Rapid diffusion
- Promotion of anisotropic grain growth
- Energy saving

Results and Discussion

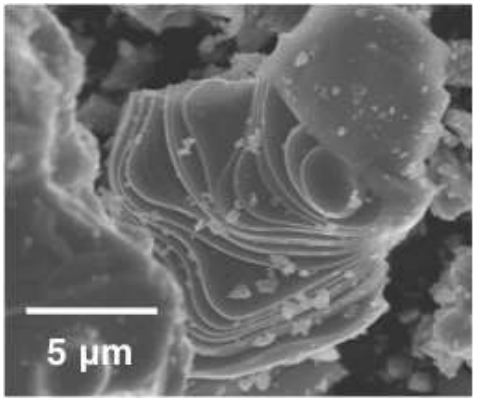
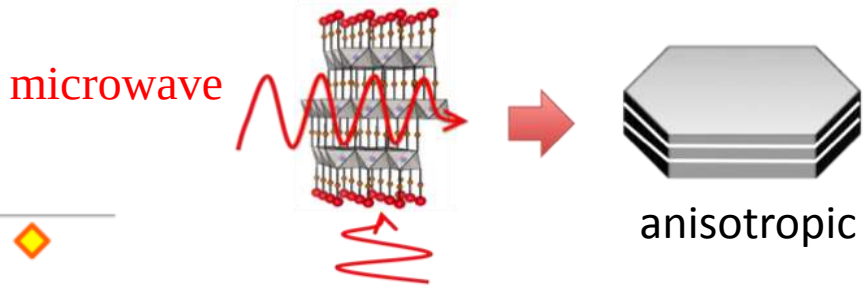


Fig.7 SEM image of delafossite-type $CuFeO_2$ synthesized at 800 ˚C by microwave irradiation

In case of microwave heating process

- $CuFeO_2$ has layered structure and grains have anisotropically grown in perpendicular to c-axis.
- It was considered microwave heating promoted the anisotropic grain growth.



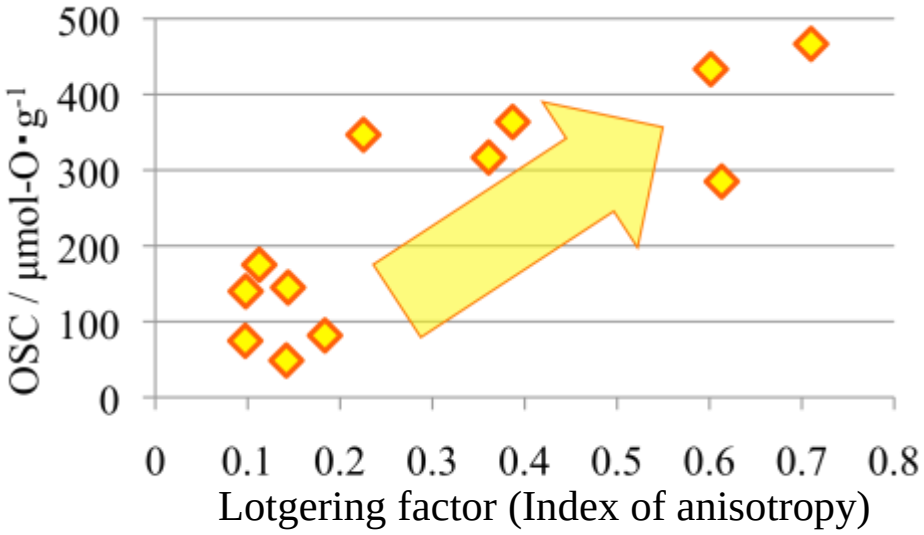


Fig.8 OSC values of anisotropic samples

Anisotropic $CuFeO_2$ synthesized by microwave irradiation shows high OSC value as compared to conventional heating samples.