Self-Regenerative Ni-Doped Catio3/Cao For Co2 Capture And Utilization

Tech ID: 33607 / UC Case 2024-705-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20250108354	04/03/2025	2024-705

Additional Patent Pending

FULL DESCRIPTION

Background

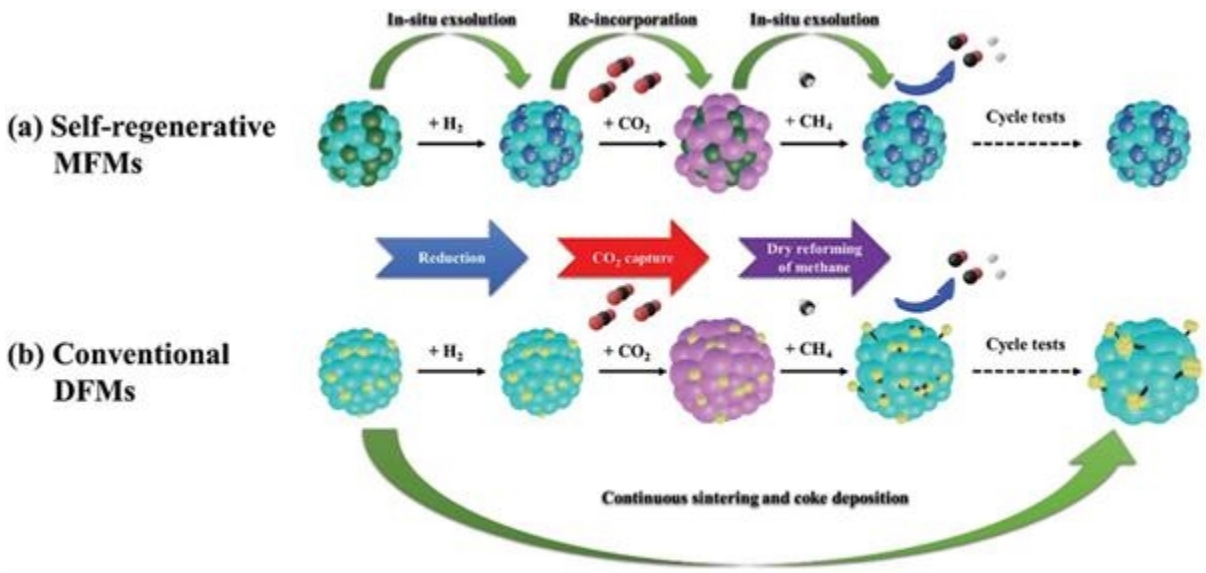
Integrated CO_2 capture and dry reforming of methane (ICCDRM) is a process that tackles two important greenhouse gases - CO_2 and methane (CH_4) - transforming them into useful syngas. Nickel/Calcium Oxide (Ni/CaO) based dual functional materials (DFM) are widely evaluated for integrated CO_2 capture and utilization (ICCU), especially in processes like dry reforming of methane (DRM), where CO_2 and CH_4 are converted into syngas. However, these conventional systems face significant challenges resulting in significant reduction in CO_2 capture and overall efficiency of ICCDRM, especially because of:

- Coke deposition on the Ni catalyst that reduces the efficacy of the catalyst; and,
- Stability of CaO resulting in pore collapse, surface area loss and/or agglomeration of Ni nanoparticles.

Invention

Prof. Abdul-Aziz and her team at UCR have developed a novel multifunctional material (MFM) designed to enhance the efficiency and stability of ICCDRM processes. The team successfully synthesized Ni-doped $CaTiO_3$/CaO nanocomposite, addressing key challenges associated with conventional Ni/CaO systems. The MFM effectively addresses the limitations of conventional systems, showcasing its potential for practical applications in carbon capture and utilization.

Images



Schematic representation of the ICCDRM process

CONTACT

Venkata S. Krishnamurty
venkata.krishnamurty@ucr.edu
tel: .

OTHER INFORMATION

KEYWORDS

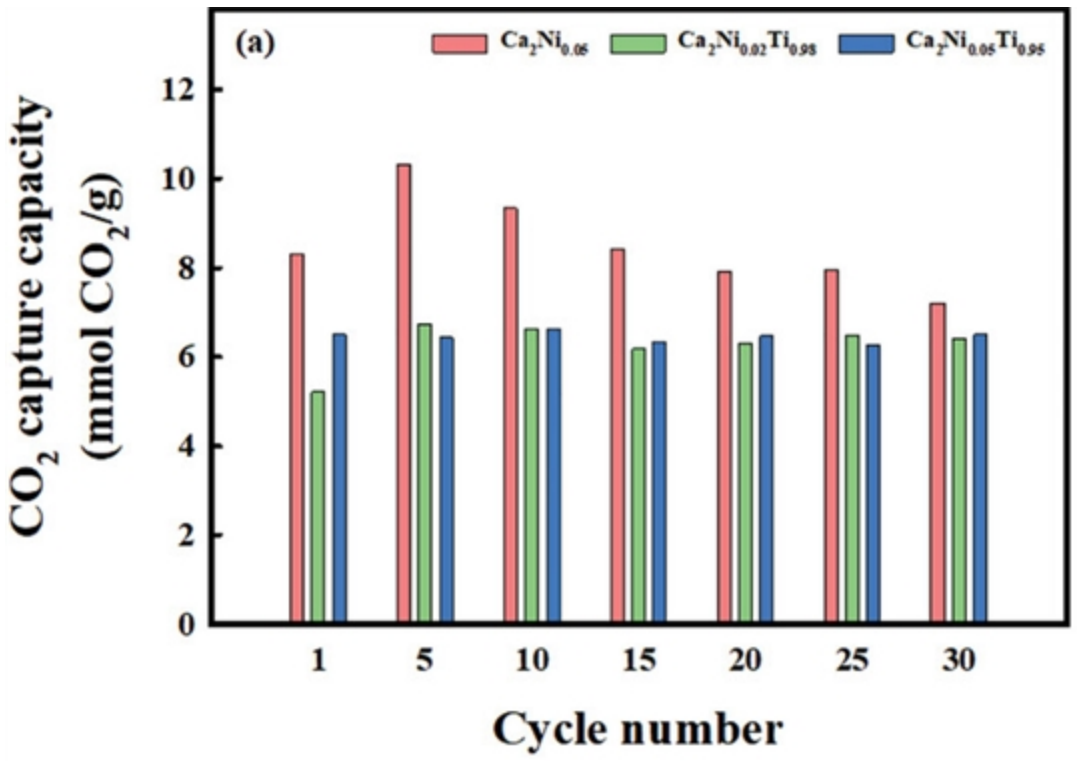
Integrated carbon capture and utilization, ICCU, ICCDRM, dry reforming of methane, DRM, multifunctional materials, syngas, greenhouse gases, GHG

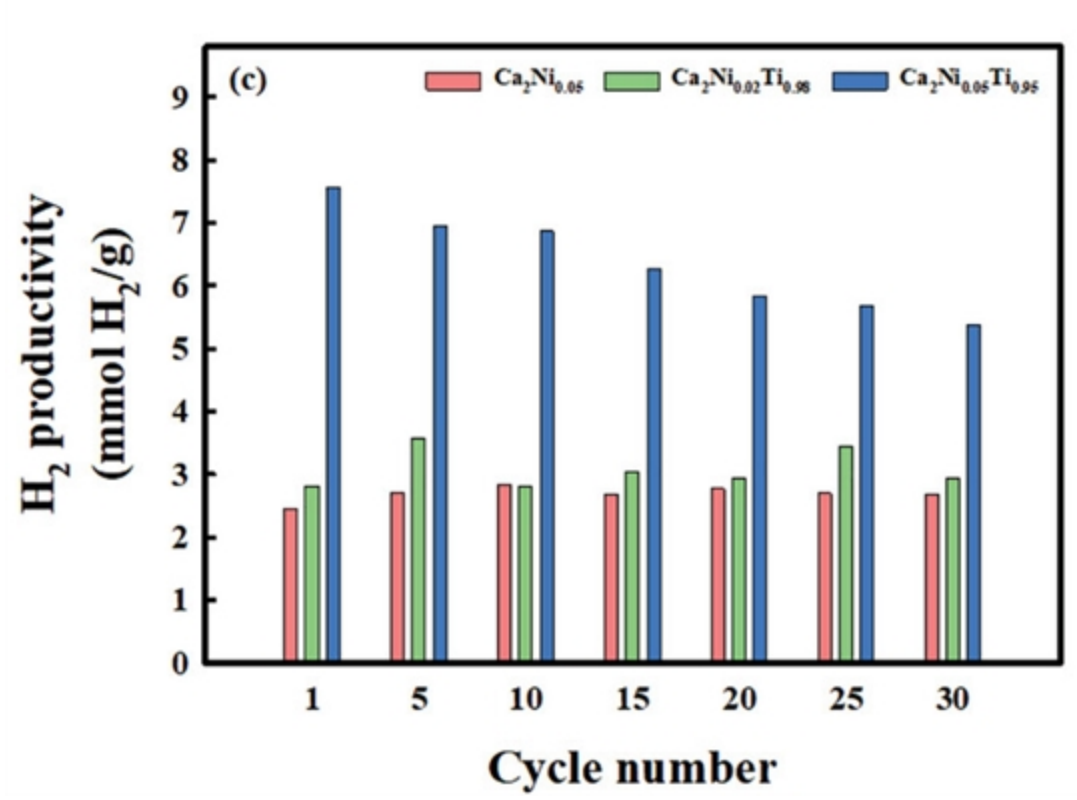
CATEGORIZED AS

- **Energy**
  - Hydrocarbon
- **Environment**
  - Remediation
- **Materials & Chemicals**
  - Chemicals
- **Nanotechnology**
  - Materials

RELATED CASES

2024-705-0





Comparison of the effectiveness of the MFM in CO_2 and H_2 production.

ADVANTAGES

- Enhanced CO2 capture capacity and stability
- Improved catalytic activity and stability
- Self-regeneration of Ni nanoparticles
- Mitigation of coke deposition

SUGGESTED USES

Capture and reformation of greenhouse gases, Carbon Dioxide and Methane - and the conversion to valuable syngas.

INVENTOR INFORMATION

Please read the recent press coverage on Prof. Abdul-Aziz's inventions

Please learn more about all of Prof. Abdul-Aziz's inventions at UCR

RELATED MATERIALS

- Self-Regenerative Ni-Doped CaTiO3/CaO for Integrated CO2 Capture and Dry Reforming of Methane

University of California, Riverside

Office of Technology Commercialization

200 University Office Building,

Riverside,CA 92521

otc@ucr.edu

https://research.ucr.edu/