



Catalysts For Aqueous Contaminant Reduction

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CONTACT

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

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	2024-010050	03/28/2024	2022-897

Additional Patent Pending

FULL DESCRIPTION

Background

In the US, the health reference level for chlorate (ClO_3^-) is set at 0.21 milligrams per liter (mg/L) and the minimum reporting level at 0.02 mg/L.

Although ClO_3^- contamination challenge for water systems has been recognized, research efforts for ClO_3^- reduction are limited. Platinum group metal (PGM) catalyzed hydrogenation provides a clean degradation route. However, most reported ClO_3^- reduction catalysts exhibit maximum activity in acidic conditions or require higher dosage (10 - 80X) of the catalyst.

Technology

Prof. Jinyong Liu and his research team have developed a novel catalyst through the use of rational chemistry and simple engineering approach. The developed ruthenium (Ru) on palladium-carbon supports (Pd/C) makes it possible to treat ClO_3^- contamination under various water conditions. The facile method yields catalysts that demonstrat robustness and unprecedented performance.

OTHER INFORMATION

KEYWORDS

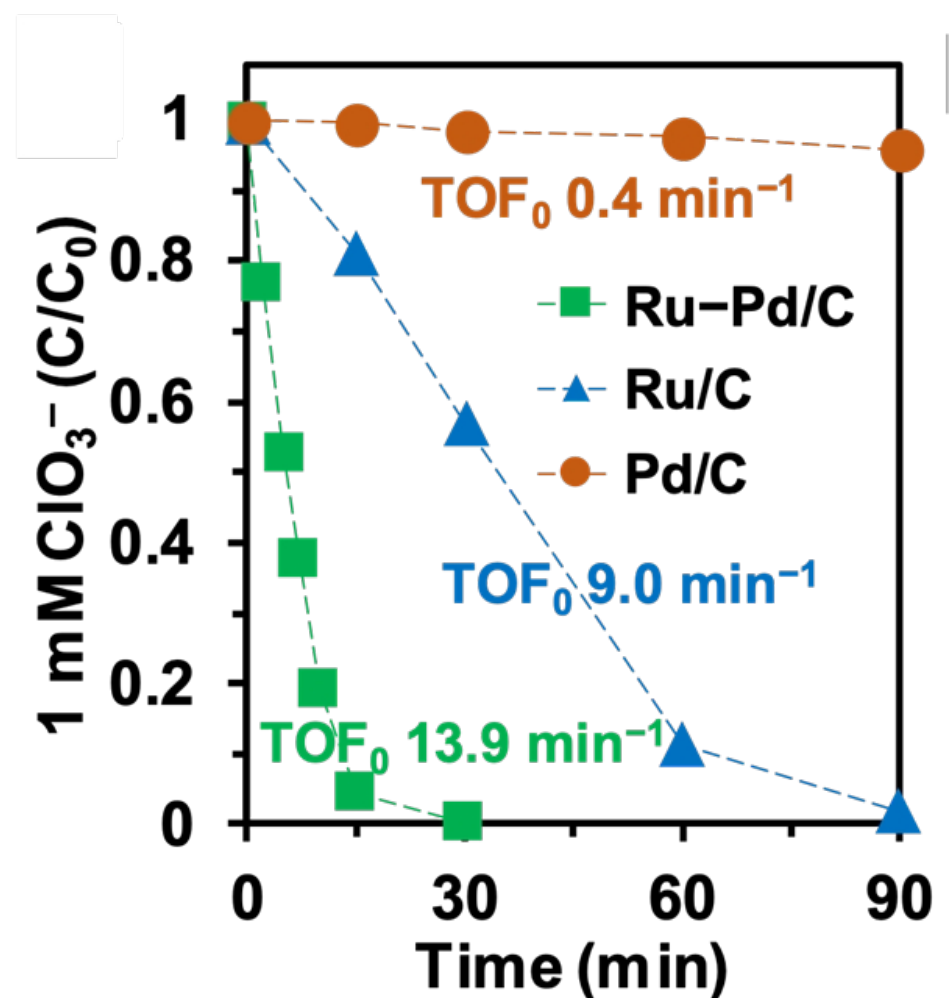
perchlorate, chlorate, chlorate contamination, catalyst, platinum group metals, ruthenium, palladium, water treatment, wastewater

CATEGORIZED AS

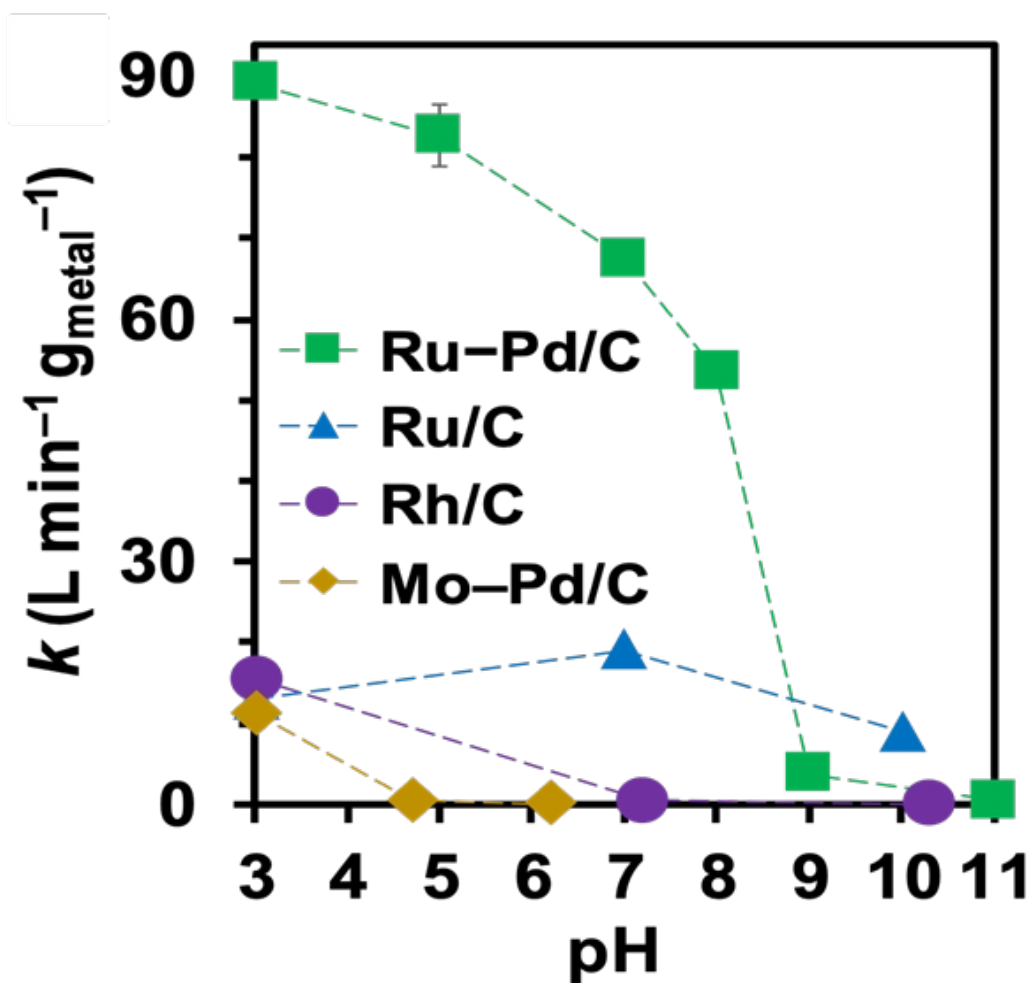
- ▶ Environment
- ▶ Remediation
- ▶ Materials & Chemicals
- ▶ Chemicals

RELATED CASES

2022-897-0



Profiles and turnover factor (TOF_0) for 1 millimolar (mM) ClO_3^- reduction by three different catalysts.



pH dependence of the Ru-Pd/C, Ru/C. First-order rate constants are normalized by the loading of PGM.

ADVANTAGES

- ▶ Facile catalyst preparation - a highly active catalyst is prepared in 20 minutes using 1 atmosphere H₂ at 20 deg. C - without any heating.
- ▶ Unprecedented catalyst performance - the catalysts show a substantially higher activity of reduction at both neutral and acidic pH.
- ▶ Higher robustness - the catalyst allows complete reduction of ClO₃⁻ even in the presence of sulphate (SO₄²⁻) and chloride (Cl⁻).
- ▶ The ruthenium and palladium exhibit bimetallic synergy.
- ▶ Reduced cost of catalyst.

SUGGESTED USES

Water treatment applications such as:

- ▶ Drinking water
- ▶ Waste-water runoffs from agriculture and dairy
- ▶ Waste-water treatment in industrial processes
- ▶ Water treatments that use various electrochemical processes

RELATED MATERIALS

- ▶ [Preparation and Synergy of Supported Ru₀ and Pd₀ for Rapid Chlorate Reduction at pH 7](#)

INVENTOR INFORMATION

- ▶ Please read [recent press coverage](#) of Prof. Jinyong Liu's research.
- ▶ Please visit [Prof. Jinyong Liu's group website](#) to learn more about their research.
- ▶ Please review [all inventions by Prof. Jinyong Liu](#) and his team at UCR

University of California, Riverside

Office of Technology Commercialization

200 University Office Building,

Riverside, CA 92521

otc@ucr.edu

