Catalysts For Aqueous Contaminant Reduction

Tech ID: 33290 / UC Case 2022-897-0

PATENT STATUS

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

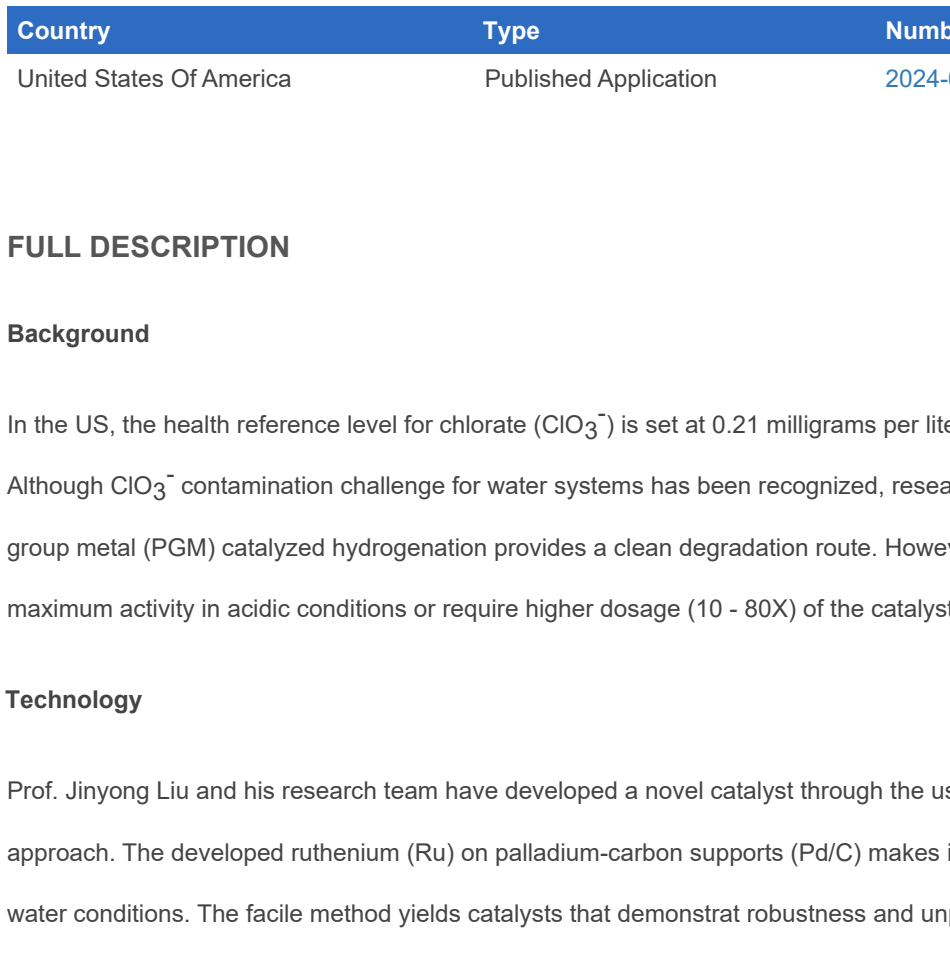
FULL DESCRIPTION

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.



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

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OTHER INFORMATION

KEYWORDS

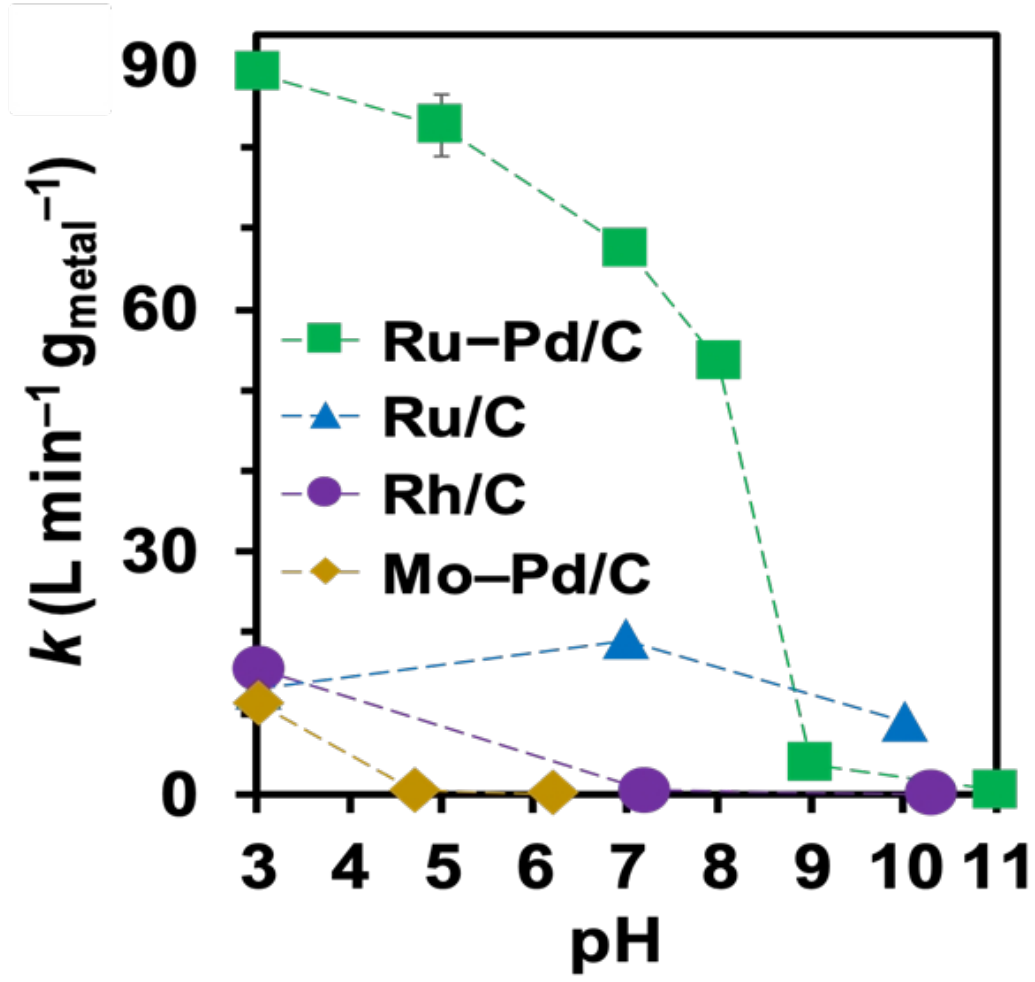
perchlorate, chlorate, chlorate contamination, catalyst, platinum group metals, ruthenium, palladium, water treatment, wastewater

CATEGORIZED AS

- Environment
  - Remediation
- Materials & Chemicals
  - Chemicals

RELATED CASES

2022-897-0



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 H_2 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 (SO_4^{2-}) 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

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