



# Catalysts For Aqueous Contaminant Reduction

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

## CONTACT

Venkata S. Krishnamurty  
[venkata.krishnamurty@ucr.edu](mailto: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

## OTHER INFORMATION

### KEYWORDS

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

## FULL DESCRIPTION

### Background

In the US, the health reference level for chlorate ( $\text{ClO}_3^-$ ) is set at 0.21 milligrams per liter (mg/L) and the minimum reporting level at 0.02 mg/L. Although  $\text{ClO}_3^-$  contamination challenge for water systems has been recognized, research efforts for  $\text{ClO}_3^-$  reduction are limited. Platinum group metal (PGM) catalyzed hydrogenation provides a clean degradation route. However, most reported  $\text{ClO}_3^-$  reduction catalysts exhibit maximum activity in acidic conditions or require higher dosage (10 - 80X) of the catalyst.

### Technology

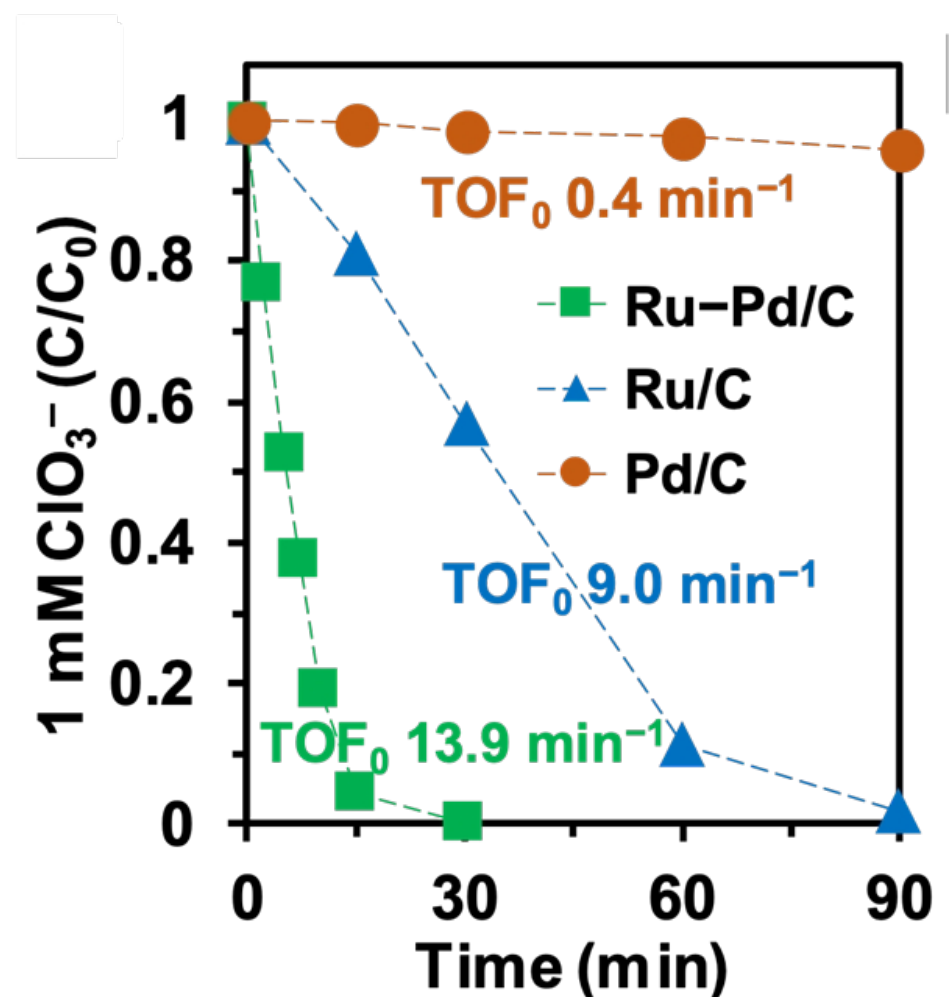
Prof. Jinyong Liu and his research team have developed a novel catalyst through the use of rational chemistry and simple engineering approach. The developed ruthenium (Ru) on palladium-carbon supports (Pd/C) makes it possible to treat  $\text{ClO}_3^-$  contamination under various water conditions. The facile method yields catalysts that demonstrat robustness and unprecedented performance.

### CATEGORIZED AS

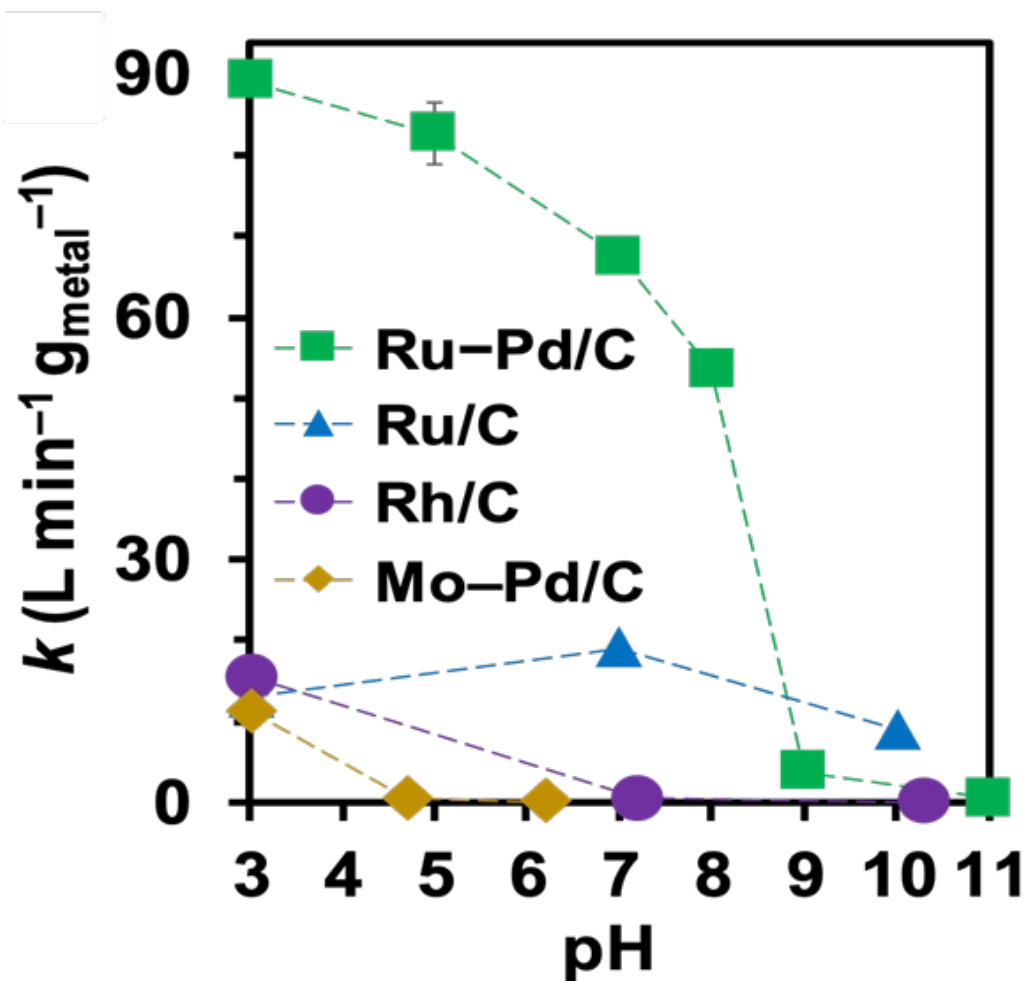
- ▶ Environment
- ▶ Remediation
- ▶ Materials & Chemicals
- ▶ Chemicals

### RELATED CASES

2022-897-0



Profiles and turnover factor ( $\text{TOF}_0$ ) for 1 millimolar (mM)  $\text{ClO}_3^-$  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 H<sub>2</sub> 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 ClO<sub>3</sub><sup>-</sup> even in the presence of sulphate (SO<sub>4</sub><sup>2-</sup>) and chloride (Cl<sup>-</sup>).
- ▶ 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 Ru<sub>0</sub> and Pd<sub>0</sub> 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](mailto:otc@ucr.edu)

