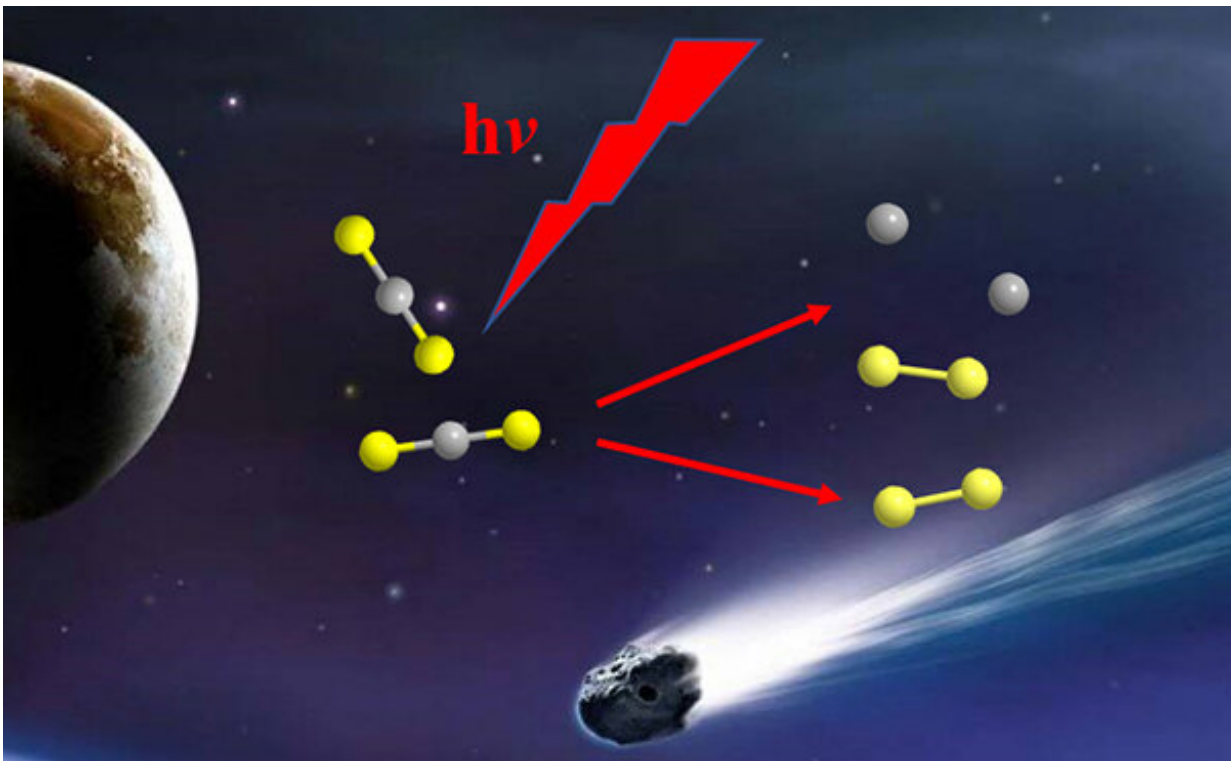


# Dalian Coherent Light Source reveals origin of interstellar disulfur

January 28 2021, by Li Yuan

---



Researchers directly observed the C + S<sub>2</sub> channel in CS<sub>2</sub> photodissociation.  
Credit: LI Zhenxing

Studying the creation and evolution of sulfur-containing compounds in outer space is essential for understanding interstellar chemistry. CS<sub>2</sub> is believed to be the most important molecule in comet nuclei, interstellar

dust, or ice cores. It could produce CS and S<sub>2</sub> fragments after photodissociation.

The International Ultraviolet Explorer satellite only observed the emission spectra of CS and S<sub>2</sub>, not that of CS<sub>2</sub>. The photodissociation mechanism of CS<sub>2</sub> [molecules](#) remains unclear, and S<sub>2</sub> fragments have not been experimentally observed before.

Recently, a team led by Prof. Yuan Kaijun from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS), in cooperation with Prof. Wang Xing'an's group from the University of Science and Technology of China, observed the C+S<sub>2</sub> product channel from CS<sub>2</sub> photodissociation for the first time using a home-made Time-Sliced Velocity Map Ion Imaging (TS-VMI) experimental setup based on the Dalian Coherent Light Source (DCLS).

The study, published in *Journal of Physical Chemistry Letters* on Jan. 11, provided direct experimental evidence for the origin of the interstellar medium S<sub>2</sub> fragments observed previously.

The researchers investigated the two-photon ultraviolet (UV) and one-photon vacuum ultraviolet (VUV) photodissociation dynamics of CS<sub>2</sub> molecules via the VUV free-electron laser (FEL) at DCLS.

They directly observed the C + S<sub>2</sub> product channel from CS<sub>2</sub> photodissociation and obtained images of the electronically ground/excited states of S<sub>2</sub> products with vibrational excitation. The electronically-excited states of the central atom of the CS<sub>2</sub> molecule played an important role in the isomerization and photodissociation processes.

This research demonstrated that interstellar medium S<sub>2</sub> fragments could be directly generated from CS<sub>2</sub> photodissociation.

"Given the similarity of OCS studied in our previous works and CS<sub>2</sub> in this work, we believe that the central-atom elimination channel is more general than expected in the [photodissociation](#) of triatomic molecules," said Prof. Yuan.

**More information:** Zhenxing Li et al. Direct Observation of the C + S<sub>2</sub> Channel in CS<sub>2</sub> Photodissociation, *The Journal of Physical Chemistry Letters* (2021). [DOI: 10.1021/acs.jpcllett.0c03386](https://doi.org/10.1021/acs.jpcllett.0c03386)

Provided by Chinese Academy of Sciences

Citation: Dalian Coherent Light Source reveals origin of interstellar disulfur (2021, January 28) retrieved 10 July 2024 from <https://phys.org/news/2021-01-dalian-coherent-source-reveals-interstellar.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.