

Abstract Submitted  
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**Photoisomerization: a new way of thinking about a longstanding problem concerning UV photochemical decomposition of CH<sub>2</sub>I<sub>2</sub> in the gas phase**<sup>1</sup> DARYA BUDKINA, SERGEY MATVEEV, CHRISTOPHER HICKS, VENIAMIN BORIN, ALEXANDER TARNOVSKY, Center for Photochemical Sciences, Department of Chemistry, Bowling Green State University — Diiodomethane (CH<sub>2</sub>I<sub>2</sub>) is a naturally occurring polyhalogenated alkane that plays an important role in atmospheric and environmental chemistry, particularly in the ozone layer decomposition. For a long time it has been assumed that UV excitation of CH<sub>2</sub>I<sub>2</sub> leads to direct photodissociation, i.e. breaking of a C-I bond and separation of polyatomic radical and halogen atom fragments without formation of any other primary product species. In our ultrafast transient absorption work powered by ultra-short (40 fs) laser pulses we show that the UV photochemistry of CH<sub>2</sub>I<sub>2</sub> is more complicated than it was previously thought. The S<sub>1</sub> excitation (330, 340 nm light) of CH<sub>2</sub>I<sub>2</sub> in the gas phase leads to ultrafast isomerization of this molecule yielding the isomeric species (CH<sub>2</sub>I-I), which has been long invoked in solution phase studies as a main, solvent-cage-induced photoproduct. The presence of this isomer is manifested by a broad transient absorption band (550 nm) emerging ~40 fs after excitation, and decaying with a ~70 fs lifetime. In the gas phase, the formation of the isomeric species takes place via the direct isomerization mechanism, i.e. without need of a solvent cage, in a quantum yield >20 %. Also, the radical dissociation channel is observed in the <400 nm region.

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