

Bromonium Ions

- Bromonium** ions were postulated almost 70 years ago to explain the stereochemical course of the addition (to give the *trans*-dibromide from a cyclic alkene).
- Olah** showed that bromonium ions are stable in liquid SO_2 with SbF_5 and can be studied directly

The Halogenation of Ethylene
By Lewis Ruffner and George A. Olah.

Recent work by Bartlett and Tarbell¹ has shown that the first step in the reaction of halogen molecules with the ethylene linkage leads to the formation of a negative halide ion and a positively charged organic ion. This ion has been postulated by 'schlenker' to have the structure:


$\text{H}_2\text{C}=\text{C}^+\text{H}_2 + \text{X}_2 \rightarrow \text{H}_2\text{C}-\text{C}^+\text{H}_2 + \text{X}^-$

Another possible structure of the ion is one in which the positive charge is on the halogen. The molecules with the ethylene linkage made to the oxygen family, should show a valence of two, i. e., it should form a structure of the ethylene oxide type.

$\text{H}_2\text{C}=\text{C}^+\text{H}_2 + \text{X}_2 \rightarrow \text{H}_2\text{C}-\text{C}^+\text{H}_2 + \text{X}^-$

Some doubt has been cast on this mechanism² because of the presumption that there should be free rotation about the C-C single bond, which would lead to a mixture of equal amounts of the *cis* and *trans* halogenation products. In these

Roberts & Kimball, *JACS* 1937, 59, 947.



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Nobel Prize "for his contribution to carbocation chemistry." (1994)
picture from <http://nobelprize.org>

Bromonium ion (stable in SO_2 solution)

CC(C)C + Br-Br + SbF5 >> CC(C)C(Br+) + SbF6-

50

