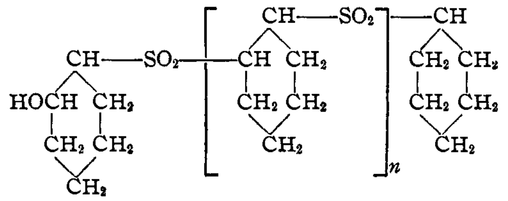
A considerable amount of sulfur containing organic material of the consistency of vaseline remained behind in the various alcohol extractions. Its composition was not determined.

Hydrolysis with 5% Sodium Hydroxide.—A mixture of 50 g. of the polymer and 140 cc. of 5% sodium hydroxide solution was heated under a reflux condenser on a steam-bath for about five days. Very little cyclohexene was produced. This solution was extracted with ether and the ether was evaporated. The residue was recrystallized from alcohol and melted at 138°. It contained sulfur; did not decolorize bromine in carbon tetrachloride solution; was not oxidized by alkaline potassium permanganate solution; and was insoluble in water, dilute acids or dilute alkalies. The analysis and molecular weight indicated that this product was dodecahydrophenoxthine dioxide.

Anal. Calcd. for $C_{12}H_{20}SO_3$: C, 59.02; H, 8.26; S, 13.1; mol. wt., 244. Found: C, 58.99; H, 8.24; S, 13.3; mol. wt. (cryoscopic in benzene), 236, 238.

Summary

1. It has been found that sulfur dioxide adds to cyclohexene in the presence of an oxidizing catalyst to produce a polymeric sulfone whose most probable structure is



2. Treatment of the polycyclohexene sulfone with chloroacetyl chloride yields a product containing halogen. Halogen analyses and molecular weight determinations indicate that the value of "*n*" is about thirty-nine, *i. e.*, the molecular weight is approximately 6000.

3. Isolation of octahydrodiphenyl, dicyclohexenyl sulfone, dodecahydrophenoxthine dioxide, cyclohexene, cyclohexenyl sulfinic or sulfonic acid and potassium sulfite from the alkaline decomposition of the polymer substantiate the above formula.

URBANA, ILLINOIS

RECEIVED JUNE 20, 1934

COMMUNICATIONS TO THE EDITOR

IODINE CATIONS

Sir:

Philbrick [THIS JOURNAL, **56,** 1257 (1934)] and Faull and Baeckström [*ibid.*, **54,** 620 (1932)] have recently concluded that the number of iodine cations in a solution of iodine monochloride is negligible. It was demonstrated in 1920 [Howell and Noyes, THIS JOURNAL, **42,** 991 (1920)] that the iodine of a number of acetylene derivatives reacts in the positive form. It is true that we did not then recognize the sharp distinction between covalent and ionic linkages which Sidgwick has shown so conclusively in his Monograph ("Some Physical Properties of the Covalent Link in Chemistry," Cornell University Press, 1933), but the demonstration that iodine may react as a cation is still satisfactory. While very many reactions of chlorine and hypochlorous acid demonstrate the existence of chlorine cations, these cannot be shown by electrometric measurements [Noyes and Wilson, THIS JOURNAL, **44,** 1633 (1922)].

The iodine cation must have the structure, $:\overset{..}{\underset{..}{I}}.$ It has recently been pointed out [Noyes, *ibid.*, **55,** 658 (1933)] that while six-electron ions frequently take part in reactions the number of such ions is always small. The structure of several hundred thousand carbon compounds has been determined on the fundamental assumption that radicals are transferred from one compound to another in chemical reactions. The results are universally accepted in spite of the fact that only a very few of the radicals have been isolated. Similar methods may be used to advantage in determining the electronic structure of many compounds and radicals. The anion ICl_2^- is assumed in the papers referred to. This is possible only by assuming a coördination number of 5 for iodine, with six unshared electrons, $:\overset{..}{\underset{..}{Cl}}\ \vdots\overset{-}{I}\vdots\ \overset{..}{\underset{..}{Cl}}:$, making the iodine negative, or that a chloride ion is held to the iodine atom by static attraction because of the positive dipole moment of the iodine monochloride. The latter appears more probable but the choice should be determined by x-ray measurements.

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