

but the Mt. Simiouse specimen is the only natural offretite we have found.

Offretite is a new member of the series of hexagonal zeolites structurally related to chabazite. Its *a*-dimension is closer to those of erionite¹ and levyne², which have both double and single rings of 6 (Si,Al)O₄ tetrahedra, than to those of gmelinite^{9,10} and chabazite¹¹, which have only double six-membered rings. A proposed frame structure for offretite, space group $P\bar{6}m2$, containing one double and one single six-membered ring per unit cell, is compared with that of erionite in Fig. 1. It will be tested by structure analysis. The relation between the two minerals resembles that between gmelinite and chabazite. Offretite has wide channels parallel to *c*, bounded by rings of twelve tetrahedra. It should therefore have sorptive and catalytic properties superior to those of erionite, but structural faults, comprising an occasional thin layer of erionite parallel to (0001), could effectively block the channels, as with disordered gmelinite. These faults would be indicated by streaks parallel to *c** in electron-diffraction patterns. Linde zeolite *T* is unlikely to have better sorptive properties than erionite, but fully ordered offretite could possibly be synthesized by careful choice of experimental conditions. Such a synthetic product would have valuable commercial applications.

Part of this work was included in a doctoral dissertation¹², and we are indebted to the Norton Company, Worcester, Massachusetts, for generous financial support. We also wish to thank Professor R. M. Barrer, Dr L. B. Sand, Dr D. L. Peterson and the Department of Mineralogy, British Museum (Natural History), for specimens of erionite and offretite.

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Received March 13; revised April 24, 1967.

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CHEMISTRY

Sodium Naphthalenide-Alkyl Halide Chemiluminescence

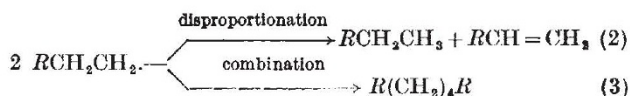
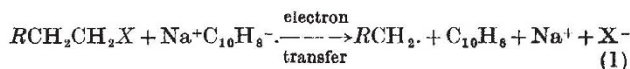
WE wish to report the production of violet chemiluminescence when alkyl halides are reacted with sodium naphthalenide at room temperature under anaerobic conditions. This effect, which can be detected by eye in a darkened room without dark adaptation, was found to be general for primary, secondary and tertiary bromides, chlorides, fluorides and iodides. Preliminary experiments show that light emission is most intense for tertiary halides and iodides.

The reaction is initiated by rapidly injecting an approximately 1 molar solution of sodium naphthalenide in dimethoxyethane into an excess of halide in dimethoxyethane which is protected from oxygen and moisture by a serum cap. Mixing is facilitated by stirring with nitrogen. Light emission is followed with a photomultiplier tube arrangement similar to that of Dimbat and Harlow¹. A Bausch and Lomb No. 33-86 grating monochromator was

inserted between the reaction vessel and photomultiplier tube for studies of chemiluminescence and fluorescence spectral distribution.

Light emission occurs immediately the reactants are mixed, and decreases to 10 per cent of the initial intensity within 1-5 min, depending on the halide and conditions used. The close correspondence between the chemiluminescence spectrum and the fluorescence spectrum of naphthalene shows that excited naphthalene is the emitting species.

A recent study of this reaction (carried out under similar conditions) suggests the following reaction path²:



Excited naphthalene could be produced directly in the electron-transfer step (1) and in the subsequent radical reactions (2) and (3) in which the excited product may transfer energy to naphthalene and give rise to a sensitized chemiluminescence. Electron transfer reactions are found to be very efficient for excitation because the energy release is rapid, and the energy is thus conserved for the production of excited states rather than dissipation through slower non-radiative processes^{3,4}. Efficient sensitized chemiluminescence involving highly condensed aromatic sensitizers has been observed for the reaction of oxalyl chloride with hydrogen peroxide⁵. We are continuing experiments designed to clarify the excitation process, and to study the effects of halide type and structure on luminescence intensity.

This work was supported by a grant from the US National Science Foundation through its College Teachers Research Program.

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Received April 7, 1967.

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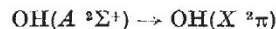
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The Chemiluminescent Reaction O + H → OH + hν

CHEMILUMINESCENCE has been observed spectroscopically in the reaction between ground state oxygen atoms and hydrogen atoms. The emission corresponds to the transition



The (0, 0) band was by far the most intense feature, but the (0, 1), (1, 0) and (1, 1) bands were also observed.

Hydrogen atoms were produced by flowing hydrogen through a Wood's tube, and oxygen atoms in the absence of oxygen by the NO-N atom titration technique¹. The gas streams were mixed in a reaction tube at a total pressure of 2 torr and flowed past the observation region with a linear velocity of about 1,000 cm/sec.

The emission was clearly shown to result from the reaction of the atoms in the reaction tube. It was not due to any discharge process or to the presence of water vapour. Nor was it caused by any process which excited ground state hydroxyl radicals.