CHEMILUMINESCENCE IN THE REACTION OF ALKALI METAL OZONIDES WITH WATER

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Transition metal hydroxides react with ozone to form ozonides (MO_3), which vigorously react with water to release oxygen [1, 2]:

$$2MO_3 + H_2O = 2MOH + 2.5O_2$$

In the present work, we were the first to find that the reaction of MO_3 with water is accompanied by infrared chemiluminescence (CL). Potassium and sodium ozonides were used. These compounds were obtained by passing a stream of 2:98 O_3-O_2 at 100 ml/min over 6 h through a finely ground powder of the hydroxide (4 g) at −5°C with subsequent extraction of the ozonide with dried liquid ammonia.

A sample of 0.06-0.08 mmole ozonide was placed in a dry box into a reactor maintained at constant 20°C and 9 ml doubly distilled water was added to give the release of O_2 and strong IR CL. For operation in the IR region, we used an FÉU-83 photomultiplier cooled to −60°C (the recording region was 1000-1300 nm taking account of the IKS-7 light filter). The CL emitter is presumably singlet oxygen. $^1O_2$ has a characteristic emission spectrum with maximum at 1270 nm [3]. Evidence for this hypothesis is also found in the quenching of the luminescence by sodium azide, which is a typical $^1O_2$ quencher [4]. Thus, for example, the CL intensity is 2.5 times less upon the addition of 2.4 mmoles NaN_3 in 9 ml water to 0.06 mmole KO_3 in comparison to the case without NaN_3.

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