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Uptake study of ClONO₂ and BrONO₂ by Halide containing droplets

G. Deiber¹, Ch. George², S. Le Calvé¹, F. Schweitzer¹, and Ph. Mirabel¹
¹Centre de Gochimie de la Surface / UMR 7517 CNRS and Univ. Louis Pasteur, 1 rue Blessig, F-67084 Strasbourg, France

²Laboratoire d'Application de la Chimie à l'Environnement (LACE), 43 boulevard du 11 novembre 1918, F-69622 Villeurbanne, France

Abstract. The uptake kinetics of gaseous ClONO₂ and BrONO₂ on aqueous surfaces were measured, as a function of temperature and liquid composition (pure water and NaCl or NaBr containing solutions) using the droplet train technique coupled to a mass spectrometer. The uptake kinetics are driven by the reactivity of these gases and, for both compounds, the uptake rates on pure water or on NaCl solutions (0.1M) are comparable. The uptake coefficient γ of ClONO₂ does not depend on the temperature while that of BrONO₂ increases slightly when the temperature is raised from 272 to 280K. For ClONO₂ and BrONO₂, the uptake rates increase on NaBr-doped droplets, enabling the estimation of the mass accommodation coefficient α . The corresponding values for α are 0.108 ± 0.033 for ClONO₂ and 0.063 ± 0.021 for BrONO₂ where the statistical errors correspond to $\pm 2\sigma$.

The reactions of ClONO₂ and BrONO₂ on NaCl solutions lead respectively to the formation of Cl₂ and BrCl. The uptake of ClONO₂ on NaBr solutions generates BrCl as primary product, which in turn can react with NaBr to produce Br₂. As expected, the only product of BrONO₂ reaction on NaBr solution is Br₂.

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