Dark formation of hydroxyl radicals (°OH) upon aeration of anoxic lake water

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Dark formation of hydroxyl radicals ($^{\bullet}$OH) upon aeration of anoxic lake water

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The hydroxyl radical ($^{\bullet}$OH) is a highly reactive transient causing the degradation of most dissolved organic and inorganic substrates (e.g. pollutants) [1]. It is formed photochemically in surface waters, by irradiation of photosensitisers such as chromophoric dissolved organic matter (CDOM), nitrite and nitrate [2-3].

Here we report for the first time that $^{\bullet}$OH can also be produced in the dark by aeration of anoxic lake water. Many lakes located in temperate environments are stratified during summer, as the warmer and oxygenated surface layer (epilimnion) floats above the colder and often anoxic deep water (ipolimnion). Lake circulation is an important phenomenon that ensures oxygenation of the water column. Dark $^{\bullet}$OH formation was measured in anoxic water (taken from the ipolimnion of different lakes during summer stratification) upon exposure to the atmosphere.

It is interesting to compare dark $^{\bullet}$OH formation with photochemical processes. The cumulated $^{\bullet}$OH concentration produced in a few hours in air-exposed ipolimnion samples can be obtained by illumination of epilimnion water under fair-weather sunlight for up to 4 months in spring-summer. This is equivalent to ≥50% of the yearly sunlight energy received by lake water. Dark $^{\bullet}$OH production is thus a new environmental process that could be very important in the $^{\bullet}$OH *budget* of lake environments. It could play a key role in the self-depollution potential of the lakes and in carbon biogeochemical cycles, increasing the bioavailability and mineralisation of dissolved organic matter.

This is an exciting new discovery that could deeply modify the current understanding of the processes taking place in lake water.

[1] K. Fenner, S. Canonica, L.P. Wackett, M. Elsner, *Science* 2013, **341**, 752-758.
[2] S.E. Page, M. Sander, W.A. Arnold, K. McNeill, *Environ. Sci. Technol.* 2012, **46**, 1590-1597.
[3] D. Vione, M. Minella, V. Maurino, C. Minero, *Chemistry- Eur. J.*, accepted.