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Contribution of organic bases to alkalinity in marine microalgae cultures

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We established the carbon fractionation in a closed photobioreactor system for different microalgae species. Between a 6.1 and 10.7% of total carbon outputs in the system was the contribution of dissolved inorganic carbon, depending on the strain and culture conditions.

The cultivation system consisted in a PBR (BIOSTAT®PBR 2S). CO_2 injection was modulated by a pH controller, maintaining a constant pH. Samples were taken daily in fed-batch cultures for measurement of biomass, dissolved organic carbon (DOC), and simultaneous determination of dissolved inorganic carbon (DIC) and total alkalinity (A_T). Organic bases (OB) are defined as the difference between measured A_T and A_T calculated from pH and the total DIC content. Cultures were performed for *Nannochloris atomus, Synechococcus sp*. and *Pleurochrysis pseudoroscoffensis*.

A continuous increase of DIC, DOC and A_T for *Nannochloris atomus* and *Synechococcus sp* was found over culture time. However, for *Plerurochrysis*, a decrease in these concentrations was observed. In all cases, inorganic carbon species were directly related to cellular density in cultures. Furthermore, exits a strong correlation between A_T and DOC.

OB in these high-density cultures have a contribution in the range of 247-634µmol kg^{-1} to A_T, depending on the cultured species. The maximum of OB was reached at the end of the exponential growth phase, except to *Pleurocrhysis pseudoroscoffensis*. These OB not only have a influence to the quantification of DIC, but influence the intensity of inflection points and shape of peaks in derivative titration curves. For *Nannochloris atomus* and *Synechococcus sp*., the intensity of inflection points decreases when DOC and cellular densities increases. However, intensity of inflection points in culture of *Pleurochrysis pseudoroscoffensis* shows an increase with DOC.

The evaluation of such organic bases in A_T, provides a best quantification of inorganic carbon outputs applied to carbon balances in photobioreactors.

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