Computational fluid dynamics for enhancing the light distribution in a photobioreactor grown culture of *Hematococcus pluvialis*

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Modern day concerns about the environment are pushing forward microalgal cultivation as an alternative for the production of both renewable energy and bioactive compounds even if up to now the maximum attainable light-energy conversion does not exceed 10%. The use of a flashing light effect attained by a well-ordered fluid dynamic regimen has shown an increase in the light utilization up to two folds. In the present work we attempted to predict arising light-dark effects by the means of a CFD simulation approach.

Two different reactors, a bubble column (BCR) and an air-lift (ALR) have been modeled, meshed [illegible] using the volume of fluid (VOF) method provided by the OpenFOAM suite. After the model validation, a particle tracking analysis has been used to compare the two geometries regarding the obtained light distribution regimen. While the BCR showed a mainly random fluid pattern, ALR was indeed well-ordered and predictable; various high frequency and two low frequency light-dark loops were identified in the latter, which could lead to increased production. To ascertain whether a real effect could be attained by those fluxes, growth experiments have been conducted in both reactors and compared to validate the hypothesis.

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