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Rapid estimation of algae biomass in a photobioreactor by means of visible spectroscopy and the statistical method of Partial Least Squares

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1 **Rapid estimation of algae biomass in a photobioreactor by means of visible spectroscopy**
2 **and the statistical method of Partial Least Squares**

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11 **Abstract**

12 Microalgae cultures, mainly employing photobioreactors, are widely employed to remove
13 nutrients from urban wastewater due to their ability to use inorganic nutrients. The microalgae
14 biomass needs to be controlled to assure suitable process conditions. Spectroscopy technique
15 based on visible wavelength combined with the Partial Least Squares multivariate method has
16 been developed to determine the microalgae cell density in a batch culture. A calibration model,
17 which relates spectra absorption to microalgae abundance, has been established. This calibration
18 model was constructed using 22 samples from the calibration data set, and the predictive
19 capacity of the model was optimized by cross validation. The predictive performance of the
20 model was validated using 40 samples in an independent data set. The model can predict the
21 correct cell density of the main microalgae group of the photobioreactor.

22 To test the accuracy of the model it was applied to the other photobioreactor cultures run in
23 different conditions. The results achieved are highly satisfactory since a good lineal adjustment
24 between observed cell densities vs. predicted ones is obtained.

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