EXPERIMENTAL MEASUREMENTS OF THE RADIATION CHARACTERISTICS OF HYDROGEN PRODUCING MICROORGANISMS

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ABSTRACT. The objective of this study is to experimentally measure the radiation characteristics of hydrogen producing microorganisms. Special attention is paid to the filamentous cyanobacteria *Anabaena variabilis* ATCC 29413-U and the unicellular purple bacteria *Rhodobacter sphaeroides* ATCC 49419, two of the most promising photobiological hydrogen producers. The extinction and absorption coefficients are measured in the spectral range from 300 to 1,300 nm using a spectrophotometer with and without an integrating sphere. Moreover, a nephelometer has been constructed to measure the scattering phase function of the microorganisms at 632.8 nm. The data is used to recover the mass specific extinction, and absorption cross-sections of the microorganisms. The scattering phase functions of both microorganisms were peaked strongly in the forward direction as expected from their size parameter and shape. Finally, the results show that absorption cross-sections of *A.variabilis* and *R.sphaeroides* have peaks that do not overlap but rather enlarge the spectral width of the absorption cross-section of a symbiotic culture. The results reported in this study are essential to accurately predict and optimize light transport in photobioreactors for photobiological hydrogen production.