Wirelessly powered submerged-light illuminated photobioreactors for efficient microalgae cultivation - DTU Orbit (25/12/2018)

**Wirelessly powered submerged-light illuminated photobioreactors for efficient microalgae cultivation**

A novel submerged-light photobioreactor (SL-PBR) with free-floating, wireless internal light sources powered by near-field resonant inductive coupling was investigated using a quick (Chlorella vulgaris) and a slow (Haematococcus pluvialis) growing microalgal species. During testing of the SL-PBR, the yield on photons was 1.18 and 1.15 g biomass mol−1 photons for C. vulgaris and H. pluvialis, respectively. At the same time, a conventional, externally illuminated PBR with the same internal light intensity produced yields of 0.78 and 0.05 g biomass mol−1 photons for C. vulgaris and H. pluvialis, respectively. Thus, the wireless internal light source was proven to be up to fivefold more effective light delivery system compared to the conventional illumination system. Meanwhile, it was discovered that some of the internal light sources had ceased to function, which might have caused underestimation of the true yield. Interestingly, the SL-PBR provided more uniform light to the culture and had the ability to reduce the presence of dark zones and the effect of self-shading. Thus, the SL-PBR showed potential, if subsequent prototype designs address the technical challenges identified during this study.

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