

### Comparative study on specific light uptake rates in various scales of photobioreactors for lumostatic operations

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*Haematococcus pluvialis* is one of the richest sources of astaxanthin (3,3'-dihydroxy-b,b-carotene-4,4'-dione), a ketocarotenoid pigment with potential effects of cancer prevention, enhancer of immune response, and a free radical quencher. The growth rate will be initially high when the cell concentration is low and thus when there is no mutual shading. As *H. pluvialis* grow, however, mutual shading increases, which decrease the specific light uptake rate, and as a result, the specific growth rate begins to fall. Lumostatic cultures of *Haematococcus pluvialis* were studied using specific light uptake rate ( $q_e$ ). The lumostatic operation is a way to maintain a proper light condition using a specific light uptake rate. Bubble-column type photobioreactors were designed and constructed with four different scales (0.4L, 2L, 10 L and 30 L). The results showed that the effectiveness of the specific light uptake rate for lumostatic operations and the superiority of the proposed method by comparing the results under lumostatic operations with those obtained constant supply of light energy. It is obvious that lumostatic operation is an efficient method to achieve high-cell density culture.