Abstract Format

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Improvement of CO_2 Dissolution in Microalgae Culture by Applications of Nano-Material

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Abstract

Annual global emission of CO_2 has escalated by 80% due to increasing dependence on the combustion of fossil fuels. TNB Research (TNBR) is currently taking the initiative to explore the various technologies in reducing CO_2 emission from thermal power plants. One option is through the biological approach by using the CO_2 as the carbon source for the growth of photoautotrophic culture of microalgae. CO_2 supplied to the suspension culture of microalgae is first dissolved to the medium and utilized by the cells. As CO_2 supply rate is more than CO_2 consumption rate by the cells, most of supplied CO_2 escapes to the atmosphere. This project aims to enhance bio-fixation ability by incorporating nano-material approach to increase the dissolution of CO_2 thus enhancing the CO_2 fixation rate by the microalgae. Consortium marine microalgae species consist of *Isochrysis sp., Chlorella sorokiniana sp., Chlorella pyreneidosa* and *Amphora sp.* were used and the culturing condition was conducted using 6 X 250L outdoor photobioreactor using actual flue gas. CFD assessment was conducted to study the velocity vector in air-lift bubling reactor. Daily sampling was conducted to measure growth & fixation rate and total inorganic carbon as indication of the CO_2 dissolution in microalgae culture. Results indicates that the highest carbon fixation rate of 0.88 gCO2/L.day was achieved. In conclusion, nano-material able to increase dissolution of CO_2 in microalgae culture, proven by the increment of inorganic carbon in the microalgae culture. However issues such as pH drop, ionic strength and alkalinity need to be cater to further improve the nano-material performance towards enhanced fixation rate. Thus the finding shall be useful in exploring further the capabilities of nano-material approaches towards enhancing the microalgae fixation rate in neutralizing carbon emissions from power plants.