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Biomass Conversion and Biorefinery
2019

## Kinetic and thermodynamic characterization of amino acids generation via subcritical water reaction of microalgae Nannochloropsis sp. biomass

(Article in press)

Zainan, N.H.[a,b], Sapardi, M.A.M.[c], Ho, B.C.H.[a], Siajam, S.I.[a], Kamal, S.M.M.[d], Danquah, M.K.[e], Harun, R.[a]

[a]Department of Chemical and Environmental Engineering, Universiti Putra Malaysia, Serdang, Selangor 43400, Malaysia
[b]Department of Biotechnology Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, 53100, Malaysia
[c]Department of Mechanical Engineering, International Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, 53100, Malaysia

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### Abstract

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Emerging applications of amino acids in the development of biopharmaceuticals, functional foods and feeds, and biostimulants in sustainable agriculture have led to increasing interests in the development of commercially-viable technologies for amino acid production. Amongst the many technologies currently used, subcritical water reaction has the potential to offer a scalable and environmentally benign approach to amino acids synthesis. The present work investigates the kinetic and thermodynamic behaviour of amino acids synthesis from Nannochloropsis sp. biomass using subcritical water. Experiments were conducted in a batch reactor at temperatures between 250-280°C for a duration of 5-20 min using 1% (w/v) microalgal loading. The aqueous phase obtained from the reaction was directly analyzed for amino acid concentration. The highest amino acids yield of 0.0196 g AA / g biomass was obtained at 260°C for 20 min, representing 44% of amino acids extracted from the biomass. A single consecutive reaction model used for data validation showed a good agreement between the experimental and theoretical data generated. The results obtained from the kinetic study demonstrated that amino acids could be produced and decomposed rapidly from the subcritical water process. Thermodynamic analysis by transition-state theory showed that the subcritical water process as endothermic, while the Gibbs free energy showed the reaction as non-spontaneous, requiring constant external energy to support it. 

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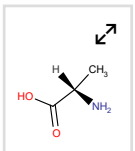


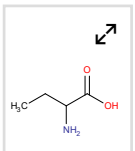


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## Author keywords

Subcritical water reaction ° Microalgae ° Reaction kinetic ° Thermodynamic ° Protein ° Amino acids

## Indexed keywords

Engineering controlled terms: Agriculture | Algae | Batch reactors | Biomass | Free energy | Gibbs free energy | Kinetics | Microorganisms | Reaction kinetics | Thermoanalysis

Engineering uncontrolled terms: Amino acid production | Environmentally benign | Micro-algae | Sustainable agriculture | Thermo dynamic analysis | Thermodynamic behaviour | Thermodynamic characterization | Transition state theories

Engineering main heading: Amino acids

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Harun, R.; Department of Chemical and Environmental Engineering, Universiti Putra Malaysia, Serdang, Selangor, Malaysia; email:mh_razif@upm.edu.my


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