Effects of Microalgae Cell Characteristics on Optimal Microalgal Biorefinery Configurations

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As each microalgae species has different cell characteristics, optimal processing pathways of microalgal biorefinery will depend on the species used as feedstock. However, such a dependence cannot be observed in the superstructure based approaches available in the literature, in which each process option is represented as a conversion based model. Motivated by this, in this study, mathematical models are developed which correlate process parameters with cell characteristics. Specifically, cell disruption processes and lipid extraction processes are considered, whose performance is highly affected by different cell characteristics (e.g. cell wall strength, lipid contents), and a few selected options are modeled. Then, these models are integrated into superstructure based optimization model, replacing conversion based models. The effects of cell characteristics on optimal microalgal biorefinery configurations are investigated through case studies.