

UNIVERSIDAD DE LA FRONTERA

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales



**BIO-OIL PRODUCTION FROM MICROALGAE BY FAST
PYROLYSIS: STUDY OF THE EFFECTS OF BIOMASS
PROPERTIES ON PRODUCT QUALITY BY USING
WHOLE AND SPENT-MICROALGAL BIOMASS AS
FEEDSTOCK**

**DOCTORAL THESIS IN FULFILLMENT OF
THE REQUIREMENTS FOR THE
DEGREE DOCTOR OF SCIENCES IN
NATURAL
RESOURCES**

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“Bio-oil production from microalgae by fast pyrolysis: Study of the effects of biomass properties on product quality by using whole and waste-microalgal biomass as feedstock”

Esta tesis fue realizada bajo la supervisión del Director de tesis, Dr. Rodrigo Navia Diez perteneciente al Departamento de Ingeniería Química de la Universidad de La Frontera y la Co-Directora de tesis, Dra. Laura Azocar Ulloa del Departamento de Química Ambiental, Facultad de Ciencias, Universidad Católica de La Santísima Concepción y ha sido aprobada por los miembros de la comisión examinadora.

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Thesis summary

"A novel use for spent microalgal (SM) biomass following a biorefinery concept was studied. The SM is produced after lipids or protein extraction to produce high value products. The thermal conversion of SM by using fast pyrolysis has been proposed as an interesting alternative. The advantage of pyrolysis is that whole microalgal (WM) biomass can be converted into three products: bio-oil, non-condensable gases (NCG) and bio-char. Therefore, the objective of this work was to study the production of bio-oil by fast pyrolysis from SM following a biorefinery concept. This thesis, it demonstrated that the proteins extraction before the pyrolysis process is feasible, obtaining protein products with potential economic value and additionally to reduce the nitrogen content in the SM the one that is used like raw material for the bio-oil production for fast pyrolysis. This SM, to the being pyrolyzed a bio-oil is obtained with lower nitrogen content, in comparison to the obtained one of finished biomass."