

UNIVERSIDAD DE LA FRONTERA

Facultad de Ingeniería y Ciencias

Doctorado en Ciencias de Recursos Naturales



**HYBRID FORWARD OSMOSIS FOR
ACID MINE DRAINAGE
WASTEWATER TREATMENT AND REUSE**

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

ERIK HUGO CABRERA CASTILLO

TEMUCO-CHILE

2020

“Hybrid forward osmosis for acid mine drainage wastewater treatment and reuse”

Esta tesis fue realizada bajo la supervisión del Dr. Gustavo Ciudad perteneciente al Departamento de Ciencias Químicas y Recursos Naturales de la Universidad de La Frontera y es presentada para su revisión por los miembros de la comisión examinadora.

.....
Dr. Dr. Andres Quiroz
DIRECTOR DEL PROGRAMA DE
DOCTORADO EN CIENCIAS DE
RECURSOS NATURALES

.....
Dr. Gustavo Ciudad

.....
Dr. Rodrigo
Navia

.....
Dr. Germán Aroca

.....
Dra. Monica Rubilar
DIRECTOR ACADÉMICO DE
POSTGRADO
UNIVERSIDAD DE LA FRONTERA

.....
Dr. David Jeison

.....
Dr. Laura Azocar

.....
Dr. Christian Antileo

Thesis summary

"The research sought to develop a system for reusing and treating wastewater from mining activities ("acid mine drainage"), using direct osmosis membranes and distillation. This acid mine drainage is dangerous for aquatic ecosystems, as it not only causes acidification of the environment, but also releases heavy metals, iron ions and leads to oxygen depletion. In addition, the mining industry consumes a large amount of clean water in its production process, all of which is affecting the water availability of communities in northern Chile."