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Publications:

Jennings, Christopher S.; Rossman, Jeremy s.; Hourihan, Braeden A.; Marshall, Ross; Forgan, Ross S.; Blight, Barry A.* "Immobilizing Giant Unilamellar Vesicles with Zirconium Metal-Organic Framework Anchors." *Soft Matter*, 2021, 17, 2024-2027 DOI: 10. 1039/D0SM02188A

The Development of New Methods for Ion Transport for the Potential Future Treatment of Channelopathies and Cancers

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Braeden A. Hourihan

in the Department of Chemistry

U.N.B., Fredericton, N.B.

Wednesday, November 30th, 2022
10:30 a.m.

Via MS TEAMS

Examining Committee

Dr. Barry Blight	Supervisor
Dr. Andreas Decken	Internal Examiner
Dr. Brian Hayden	Int-Ext Examiner
Dr. Gilles Villemure	Chair of Oral Examination

Abstract

Channelopathies are diseases caused by disruption of the process of ion transport within the cell, cystic fibrosis being one of the most well-known examples of these diseases. Developing new methods of synthetically transporting ions into cells with non-functioning protein channels are imperative for advancing treatment of these diseases. Cancer drugs that function as ion transporters have also recently become of interest to scientists. These drugs work to induce cellular apoptosis of cancer cells by causing a rapid influx of ions to disrupt the cells ion homeostasis and are proving to be efficient in treating cancer. During cancer treatment, life saving drugs, and dyes used to image tumours must be administered separately. Within the field of theranostics, scientists have sought out to combine therapeutic drugs and diagnostic tools to solve this problem, however, there has yet to be a solution developed that can both induce cellular apoptosis through ion transport, and act as a tumour imaging dye. Within this project we have developed the first reported series of new iridium (III) complexes that can act as both bioimaging dyes and as anion transporters towards future treatment of channelopathies and cancers, and separately demonstrate anion transport using micron-sized metal-organic framework crystals as anchors/channels for model cells.