Faculty of Science
Chemistry Department

Different Corrosion Protection Technologies for Energy Recovery with Mini-Hydro Turbines in Brackish Water Desalination Plants

A Thesis Presented by

Ahmed Helmy Abd El-Aziz Mostafa

B.Sc. (2007), M.Sc. (2014) (Zagazig University)

For the degree of Doctor of Philosophy of Science in Chemistry

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Chemistry Department

Faculty of Science

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قَالُوا سُبْحَانَكَ

لا عِلْمَ لَنَا إِلا مَا عَلَّمْتَنَا

إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم
سورة البقرة :٣٢

Dedicated to

Allah, All MEMBERS OF MY

FAMILY, FRIENDS AND FOR MY

DEAR FRIEND

DR. Tarek Samir Jamil

All of those who Love me

Ahmed Helmy Abd El-Aziz

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Ahmed Helmy Abd El-Aziz

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List of Schemes

List of Abbreviations

2θ	2 Theta
APS	Ammonium peroxydisulfate
Al-ZSM-5	Aluminum Zeolite Socony Mobil- Five
BEA Zeolites	Beta polymorph A Zeolite
cm^{-1}	Wavenumber
CP	Cathodic Protection
DO	Dissolved Oxygen
DTG	Differential thermogravimetric analysis
DSC	Differential Scanning Calorimetry analysis
ERD	Energy recovery devices
IR	Infrared
LCC	Life Cycle Cost
LTA	Zeolite Framework Type Linde Type A
LTN	Zeolite Framework Type Linde Type N
MCM-41	(Mobil Composition of Matter No. 41) is a mesoporous material with a hierarchical structure from a family of silicate and alumosilicate solids that were first developed by researchers at Mobil Oil Corporation and that can be used as catalysts or catalyst supports
MED	Multiple-effect distillation
MFI zeolite	Mordenite Framework Inverted (zeolites)
MSF	Multi-stage flash distillation
PANI	Polyaniline
ppm	Part per million
PX	Pressure Ex-changer device
RO	reverse osmosis process
SAPO-5 zeolites	Silico alumino phosphate Five Zeolites
SEM	Scanning Electron Microscope
Sil-1 Zeolites	Silicalite-1 Zeolites
SW	Sea water
SWRO	Seawater reverse osmosis
TDS	Total dissolved solids
TEM	Transmittance Electron Microscope
TGA	Thermogravimetric analysis
TS-1 Zeolites	Titanium silicalite-1 Zeolites
UV-Vis.	Ultraviolet-Visible
XRD	X-ray diffraction analysis
	Type of synthetic Zeolite called Faujasite, depending on the silica-to-alumina ratio of their