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**Increased Order in Single Molecule  
Magnets**

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## Abstract

Single Molecule Magnets (SMMs) show promise in advancing computer technology and our understanding of quantum behaviours, however we first have to understand how to successfully synthesize ligand systems that allow them to perform at viable temperatures. As such, my project explored the synthesis of new ligand systems for potential SMMs based on [2.2]paracyclophane and pyrazine. These structures were chosen to be a synthetic backbone for the synthesis of new ligands for potential SMMs formation due to their structural and electronic properties. Attempts were undertaken to form complexes with these ligands and grow crystals suitable for X-ray crystallography.

In this project three new ligand systems were synthesized and characterized, one with a [2.2]paracyclophane backbone (**L**<sub>1</sub>) and two containing a pyrazine bridging group (**L**<sub>2</sub> and **L**<sub>3</sub>). Complexations with a variety of metals were undertaken with all three ligands, unfortunately crystals of sufficient quality for single crystal X-ray diffraction experiments were not obtained. In total 8 new compounds were synthesized and a novel route for the synthesis of 4-(benzylamino)[2.2]PC was developed during this project.

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## Table of Contents

<b>1.</b>	<b>Introduction</b>	1
1.1	Single Molecule Magnets	1
1.2	Salicylaldoximes	11
1.3	[2.2]Paracyclophane	14
1.4	Pyrazine	17
1.5	Aims of this research	20
<b>2.</b>	<b>Results and Discussion</b>	22
2.1	[2.2]Paracyclophane synthesis	22
2.2	2,5-Dimethylpyrazine synthesis	40
<b>3.</b>	<b>Conclusion</b>	49
<b>4.</b>	<b>Future Work</b>	51
<b>5.</b>	<b>Experimental Methods</b>	53
<b>6.</b>	<b>References</b>	85
<b>7.</b>	<b>Additional Information</b>	92

## Abbreviations

[2.2]PC	[2.2]Paracyclophane
AC	Alternating Current
Ac	Acetyl
BINAP	2,2'-Bis(diphenylphosphino)-1,1'-binaphthyl
Bn	Benzyl
dba	Dibenzylideneacetone
DC	Direct Current
DCM	Dichloromethane
DMF	Dimethylformamide
DMSO	Dimethyl sulfoxide
EDTA	Ethylenediaminetetraacetic acid
Et	Ethyl
<i>H</i>	External magnetic field
K	Kelvin
<i>m</i> -CPBA	<i>meta</i> -Chloroperoxybenzoic acid
Me	Methyl
NBS	<i>N</i> -Bromosuccinimide
NMR	Nuclear Magnetic Resonance
Ph	Phenyl
QTM	Quantum Tunnelling of Magnetism
RT	Room Temperature
<i>S</i>	Spin state
sao	Salicylaldoxime
SMM	Single Molecule Magnets
T	Tesla
T <sub>B</sub>	Blocking temperature

THF	Tetrahydrofuran
TLC	Thin Layer Chromatography
Ts	4-toluenesulfonyl
$U_{\text{eff}}$	Thermal barrier
$X_m''$	Out-of-phase component