

# Table of Content

<b>1. Introduction</b>	<b>1</b>
1.1. Perovskites Preparation Methods . . . . .	3
1.2. Doping of $ABO_3$ Perovskites . . . . .	4
1.3. Applications of Perovskites . . . . .	5
1.4. Perovskites in SOFC . . . . .	7
1.5. B site doping of $BaFeO_3$ . . . . .	10
1.6. Mechanical Properties . . . . .	11
<b>2. Literature Review</b>	<b>15</b>
2.1. $BaFeO_{3-\delta}$ based cathode for SOFCs . . . . .	15
2.2. Lanthanum doping of $BaFeO_{3-\delta}$ . . . . .	18
2.3. Niobium doping of $BaFeO_{3-\delta}$ . . . . .	20
2.4. Mechanical Properties of perovskites based oxides . . . . .	23
2.5. Perovskite Applications in Membrane . . . . .	25
2.6. Miscellaneous applications . . . . .	28
<b>3. Methodology</b>	<b>31</b>
3.1. Materials . . . . .	31
3.2. Sol-Gel Method . . . . .	31
3.2.1. Principle . . . . .	31
3.2.2. Fabrication of BFO . . . . .	32
3.2.3. Fabrication of La-doped-BFO . . . . .	32
3.2.4. Fabrication of Nb-doped-BFO . . . . .	32
3.3. Calcination and Sintering . . . . .	33
3.4. XRD (X-RAY DIFFRACTION) . . . . .	34
3.4.1. Principle . . . . .	34
3.4.2. XRD experiments . . . . .	35
3.5. Thermogravimetric Analysis / Differential Thermal Analysis . . . . .	36
3.6. Scanning Electron Microscope (SEM) . . . . .	36
3.6.1. Principle . . . . .	36
3.6.2. Applications . . . . .	37
3.7. Mechanical Testing . . . . .	37

3.7.1. Sample Preparation . . . . .	37
3.7.2. Uniaxial Compression Test . . . . .	37
3.7.3. Micro hardness test . . . . .	39
<b>4. Results And Discussion</b>	<b>40</b>
4.1. Structural Characterisation . . . . .	40
4.2. SEM Results . . . . .	43
4.2.1. SEM results for BFO . . . . .	43
4.2.2. SEM results for BFNbO: . . . . .	47
4.3. Compression Tests . . . . .	49
4.3.1. Microhardness Test . . . . .	51
4.3.1.1. Effect of La and Nb doping on Micro Hardness and fracture toughness of BFO . . . . .	51
<b>5. Conclusion</b>	<b>55</b>
<b>Bibliography</b>	<b>56</b>