**Table 1. Dataset: Experimental results of the doped spinel material formula, X-ray Diffraction characterisation (Crystal lattice constant-a), testing conditions and the corresponding initial discharge and the 20th end cycle discharge capacities of doped spinel cathodes.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Doping Materials**  **(M)** | **Li** | **M** | **Mn** | **O** | **M-Electronegativity** | **Molecular Weight of cathode material (g/mol)** | **Space Group of Cathode Material** | **Lattice Constant a (Å)** | **Testing C-rate (mAg-1)** | **Initial Discharge Capacity (mAhg-1)** | **20th cycle Discharge Capacity**  **(mAhg-1)** | **Ref.** |
| Al | 1 | 0.1 | 1.9 | 4 | 1.61 | 178.02 | Fd3m | 8.235 | 133.00 | 106.39 | 96.45 | [1] |
| Al | 1 | 0.2 | 1.8 | 4 | 1.61 | 175.23 | Fd3m | 8.219 | 133.00 | 99.77 | 88.58 | [1] |
| Cr | 1 | 0.04 | 1.96 | 4 | 1.66 | 180.70 | Fd3m | 8.209 | 21.40 | 120.61 | 106.86 | [2] |
| Cr | 1 | 0.06 | 1.94 | 4 | 1.66 | 180.64 | Fd3m | 8.201 | 21.40 | 119.84 | 110.27 | [2] |
| Cr | 1 | 0.08 | 1.92 | 4 | 1.66 | 180.58 | Fd3m | 8.200 | 21.40 | 117.15 | 107.78 | [2] |
| Cr | 1 | 0.1 | 1.9 | 4 | 1.66 | 180.52 | Fd3m | 8.196 | 21.40 | 112.52 | 105.64 | [2] |
| Ce | 1 | 0.01 | 1.99 | 4 | 1.12 | 181.67 | Fd3 m | 8.182 | 74.00 | 135.00 | 130.76 | [3] |
| Ce | 1 | 0.03 | 1.97 | 4 | 1.12 | 183.37 | Fd3 m | 8.193 | 74.00 | 130.00 | 127.01 | [3] |
| Ce | 1 | 0.05 | 1.95 | 4 | 1.12 | 185.08 | Fd3 m | 8.199 | 74.00 | 126.00 | 125.70 | [3] |
| Ce | 1 | 0.1 | 1.9 | 4 | 1.12 | 189.33 | Fd3 m | 8.210 | 74.00 | 119.00 | 118.68 | [3] |
| Sc | 1 | 0.04 | 1.96 | 4 | 1.36 | 180.42 | Fd3 m | 8.230 | 148.00 | 119.00 | 107.46 | [4] |
| Sc | 1 | 0.06 | 1.94 | 4 | 1.36 | 180.22 | Fd3 m | 8.229 | 148.00 | 119.00 | 113.47 | [4] |
| Sc | 1 | 0.08 | 1.92 | 4 | 1.36 | 180.02 | Fd3 m | 8.227 | 148.00 | 115.00 | 110.71 | [4] |
| Sc | 1 | 0.1 | 1.9 | 4 | 1.36 | 179.82 | Fd3 m | 8.225 | 148.00 | 111.00 | 107.88 | [4] |
| Ni | 1 | 0.08 | 1.92 | 4 | 1.91 | 181.12 | Fd3 m | 8.221 | 148.00 | 93.60 | 83.64 | [5] |
| Ni | 1 | 0.08 | 1.92 | 4 | 1.91 | 181.12 | Fd3 m | 8.227 | 148.00 | 100.20 | 96.27 | [5] |
| Ni | 1 | 0.08 | 1.92 | 4 | 1.91 | 181.12 | Fd3 m | 8.227 | 148.00 | 105.00 | 103.01 | [5] |
| Ni | 1 | 0.08 | 1.92 | 4 | 1.91 | 181.12 | Fd3 m | 8.230 | 148.00 | 93.20 | 89.01 | [5] |
| Mg | 1 | 0.02 | 1.98 | 4 | 1.31 | 180.20 | Fd3 m | 8.229 | 74.00 | 123.40 | 114.89 | [6] |
| Mg | 1 | 0.05 | 1.95 | 4 | 1.31 | 179.29 | Fd3 m | 8.220 | 74.00 | 122.00 | 118.00 | [6] |
| Mg | 1 | 0.1 | 1.9 | 4 | 1.31 | 177.75 | Fd3 m | 8.217 | 74.00 | 109.20 | 105.71 | [6] |
| Al | 1 | 0.1 | 1.9 | 4 | 1.61 | 178.02 | Fd3 m | 8.211 | 150.00 | 97.59 | 96.45 | [7] |
| Al | 1 | 0.1 | 1.9 | 4 | 1.61 | 178.02 | Fd3 m | 8.211 | 25.20 | 111.02 | 99.58 | [8] |
| Ni | 1 | 0.1 | 1.9 | 4 | 1.91 | 181.19 | Fd3 m | 8.227 | 23.00 | 117.00 | 109.70 | [9] |
| Cr | 1 | 0.02 | 1.98 | 4 | 1.66 | 180.76 | Fd3 m | 8.214 | 53.81 | 99.35 | 97.46 | [10] |
| Cr | 1 | 0.05 | 1.95 | 4 | 1.66 | 180.67 | Fd3 m | 8.218 | 53.81 | 103.98 | 101.42 | [10] |
| Cr | 1 | 0.1 | 1.9 | 4 | 1.66 | 180.52 | Fd3 m | 8.215 | 53.81 | 116.91 | 109.42 | [10] |
| Cr | 1 | 0.05 | 1.95 | 4 | 1.66 | 180.67 | Fd3 m | 8.243 | 74.00 | 117.82 | 112.51 | [11] |
| Cr | 1 | 0.1 | 1.9 | 4 | 1.66 | 180.52 | Fd3 m | 8.240 | 74.00 | 109.78 | 106.89 | [11] |
| Cr | 1 | 0.15 | 1.85 | 4 | 1.66 | 180.38 | Fd3 m | 8.235 | 74.00 | 102.65 | 101.54 | [11] |
| Cr | 1 | 0.2 | 1.8 | 4 | 1.66 | 180.23 | Fd3 m | 8.235 | 74.00 | 110.47 | 108.55 | [11] |
| Gd | 1 | 0.04 | 1.96 | 4 | 1.2 | 184.91 | Fd3 m | 8.241 | 80.00 | 70.30 | 64.27 | [12] |
| Zn | 1 | 0.01 | 1.99 | 4 | 1.65 | 180.92 | Fd3 m | 8.182 | 74.00 | 129.00 | 127.94 | [13] |
| Zn | 1 | 0.05 | 1.95 | 4 | 1.65 | 181.34 | Fd3 m | 8.193 | 74.00 | 126.00 | 125.36 | [13] |
| Zn | 1 | 0.1 | 1.9 | 4 | 1.65 | 181.86 | Fd3 m | 8.200 | 74.00 | 123.00 | 122.00 | [13] |
| Zn | 1 | 0.15 | 1.85 | 4 | 1.65 | 182.38 | Fd3 m | 8.212 | 74.00 | 118.00 | 113.35 | [13] |
| Si | 1 | 0.1 | 1.9 | **4** | 1.9 | 178.13 | Fd3 m | 8.246 | 83.50 | 123.35 | 112.72 | [14] |
| Si | 1 | 0.08 | 1.92 | 4 | 1.9 | 178.67 | Fd3 m | 8.248 | 83.50 | 132.23 | 121.89 | [14] |
| Si | 1 | 0.05 | 1.95 | 4 | 1.9 | 179.47 | Fd3 m | 8.247 | 83.50 | 134.47 | 127.10 | [14] |
| Si | 1 | 0.02 | 1.98 | 4 | 1.9 | 180.28 | Fd3 m | 8.246 | 83.50 | 130.06 | 116.84 | [14] |
| B | 1 | 0.04 | 1.96 | 4 | 2.04 | 179.05 | Fd3m | 8.256 | 59.20 | 95.00 | 70.11 | [15] |
| Co | 0.98 | 0.05 | 1.94 | 4 | 1.88 | 180.33 | Fd3m | 8.235 | 59.20 | 122.00 | 97.94 | [15] |
| Ni | 0.99 | 0.05 | 1.94 | 4 | 1.91 | 180.39 | Fd3m | 8.238 | 59.20 | 125.00 | 98.99 | [15] |
| Al | 0.95 | 0.05 | 1.96 | 4 | 1.61 | 179.62 | Fd3m | 8.238 | 59.20 | 133.00 | 100.02 | [15] |
| Ni | 1 | 0.01 | 1.99 | 4 | 1.91 | 180.85 | Fd3 m | 8.246 | 148.00 | 109.80 | 97.40 | [16] |
| Ni | 1 | 0.03 | 1.97 | 4 | 1.91 | 181.19 | Fd3 m | 8.244 | 148.00 | 107.80 | 103.50 | [16] |
| Ni | 1 | 0.05 | 1.95 | 4 | 1.91 | 181.19 | Fd3 m | 8.241 | 148.00 | 104.50 | 101.17 | [16] |
| Ni | 1 | 0.08 | 1.92 | 4 | 1.91 | 181.19 | Fd3 m | 8.239 | 148.00 | 104.93 | 101.30 | [16] |
| Ni | 1 | 0.1 | 1.9 | 4 | 1.91 | 181.19 | Fd3 m | 8.236 | 148.00 | 99.30 | 95.52 | [16] |
| Sn | 1 | 0.02 | 1.98 | 4 | 1.96 | 182.09 | Fd3 m | 8.215 | 32.00 | 122.74 | 120.58 | [17] |
| Sn | 1 | 0.04 | 1.96 | 4 | 1.96 | 183.37 | Fd3 m | 8.209 | 32.00 | 112.79 | 111.62 | [17] |
| Al | 1 | 0.05 | 1.95 | 4 | 1.61 | 179.42 | Fd3 m | 8.238 | 148.00 | 121.04 | 119.51 | [18] |
| Al | 1 | 0.1 | 1.9 | 4 | 1.61 | 178.02 | Fd3 m | 8.238 | 148.00 | 116.52 | 116.30 | [18] |
| Al | 1 | 0.15 | 1.85 | 4 | 1.61 | 176.62 | Fd3 m | 8.228 | 148.00 | 107.98 | 107.50 | [18] |
| Al | 1 | 0.2 | 1.8 | 4 | 1.61 | 175.23 | Fd3 m | 8.230 | 148.00 | 94.59 | 93.98 | [18] |
| Nd | 1 | 0.01 | 1.99 | 4 | 1.14 | 181.71 | Fd3 m | 8.254 | 20.00 | 149.00 | 130.60 | [19] |
| B | 1 | 0.1 | 1.9 | 4 | 2.04 | 176.40 | Fd3 m | 8.173 | 74.00 | 53.33 | 43.33 | [20] |
| B | 1 | 0.2 | 1.8 | 4 | 2.04 | 171.99 | Fd3 m | 8.247 | 74.00 | 63.68 | 56.49 | [20] |
| B | 1 | 0.3 | 1.7 | 4 | 2.04 | 167.58 | Fd3 m | 8.246 | 74.00 | 91.75 | 81.75 | [20] |
| B | 1 | 0.4 | 1.6 | 4 | 2.04 | 163.17 | Fd3 m | 8.233 | 74.00 | 50.18 | 44.74 | [20] |
| Mg | 1 | 0.08 | 1.92 | 4 | 1.31 | 178.37 | Fd3 m | 8.211 | 26.00 | 98.68 | 96.57 | [21] |
| Mg | 1 | 0.08 | 1.92 | 4 | 1.31 | 178.37 | Fd3 m | 8.212 | 26.00 | 99.63 | 99.05 | [21] |
| Mg | 1 | 0.08 | 1.92 | 4 | 1.31 | 178.37 | Fd3 m | 8.214 | 26.00 | 101.15 | 100.57 | [21] |
| Mg | 1 | 0.08 | 1.92 | 4 | 1.31 | 178.37 | Fd3 m | 8.227 | 26.00 | 106.87 | 102.48 | [21] |
| Mg | 1 | 0.08 | 1.92 | 4 | 1.31 | 178.37 | Fd3 m | 8.236 | 26.00 | 90.87 | 82.48 | [21] |
| Mg | 1 | 0.02 | 1.98 | 4 | 1.31 | 180.20 | Fd3 m | 8.227 | 30.00 | 105.24 | 97.62 | [22] |
| Mg | 1 | 0.04 | 1.96 | 4 | 1.31 | 179.59 | Fd3 m | 8.223 | 30.00 | 106.69 | 100.94 | [22] |
| Mg | 1 | 0.06 | 1.94 | 4 | 1.31 | 178.98 | Fd3 m | 8.221 | 30.00 | 100.33 | 95.60 | [22] |
| Mg | 1 | 0.08 | 1.92 | 4 | 1.31 | 178.37 | Fd3 m | 8.220 | 30.00 | 99.18 | 96.75 | [22] |
| Mg | 1 | 0.1 | 1.9 | 4 | 1.31 | 177.75 | Fd3 m | 8.217 | 30.00 | 97.01 | 94.30 | [22] |
| Mg | 1 | 0.15 | 1.85 | 4 | 1.31 | 176.22 | Fd3 m | 8.210 | 30.00 | 88.06 | 85.92 | [22] |
| Ga | 1 | 0.1 | 1.9 | 4 | 1.81 | 182.30 | Fd3 m | 8.217 | 148.00 | 97.83 | 94.20 | [23] |
| Si | 1 | 0.05 | 1.95 | 4 | 1.9 | 179.47 | Fd3 m | 8.237 | 148.00 | 141.34 | 134.89 | [23] |
| Al | 1 | 0.02 | 1.98 | 4 | 1.61 | 180.26 | Fd3 m | 8.218 | 29.60 | 112.23 | 100.46 | [24] |
| Al | 1 | 0.04 | 1.96 | 4 | 1.61 | 179.70 | Fd3 m | 8.216 | 29.60 | 108.70 | 101.64 | [24] |
| Al | 1 | 0.08 | 1.92 | 4 | 1.61 | 178.58 | Fd3 m | 8.214 | 29.60 | 100.34 | 95.05 | [24] |
| Zn | 1 | 0.02 | 1.98 | 4 | 1.65 | 181.03 | Fd3 m | 8.247 | 148.00 | 113.00 | 102.86 | [25] |
| Co | 1 | 0.02 | 1.98 | 4 | 1.88 | 180.90 | Fd3 m | 8.226 | 148.00 | 124.00 | 113.81 | [25] |
| Ni | 1 | 0.02 | 1.98 | 4 | 1.91 | 180.89 | Fd3 m | 8.215 | 148.00 | 127.00 | 120.78 | [25] |
| In | 1 | 0.02 | 1.98 | 4 | 1.78 | 182.01 | Fd3 m | 8.110 | 148.00 | 134.00 | 124.60 | [25] |
| Al | 1 | 0.05 | 1.95 | 4 | 1.61 | 179.42 | Fd3 m | 8.211 | 42.00 | 126.20 | 121.32 | [26] |
| Al | 1 | 0.05 | 1.95 | 4 | 1.31 | 179.42 | Fd3 m | 8.209 | 42.00 | 127.90 | 123.09 | [26] |
| Mg | 1 | 0.06 | 1.94 | 4 | 1.31 | 178.98 | Fd3 m | 8.229 | 55.00 | 123.19 | 120.96 | [27] |
| Si | 1 | 0.06 | 1.94 | 4 | 1.9 | 179.21 | Fd3 m | 8.234 | 55.00 | 134.68 | 120.32 | [27] |
| Co | 1 | 0.16 | 1.84 | 4 | 1.88 | 181.46 | Fd3 m | 8.210 | 30.00 | 96.70 | 94.74 | [28] |
| Ru | 1 | 0.1 | 1.9 | 4 | 2.2 | 185.43 | Fd3 m | 8.250 | 17.00 | 102.55 | 84.90 | [29] |
| Ru | 1 | 0.25 | 1.75 | 4 | 2.2 | 192.35 | Fd3 m | 8.249 | 17.00 | 117.82 | 90.00 | [29] |
| Zn | 1 | 0.02 | 1.98 | 4 | 1.65 | 181.03 | Fd3 m | 8.194 | 148.00 | 107.50 | 95.05 | [30] |
| Zn | 1 | 0.05 | 1.95 | 4 | 1.65 | 181.34 | Fd3 m | 8.184 | 148.00 | 102.60 | 93.27 | [30] |
| Zn | 1 | 0.1 | 1.9 | 4 | 1.65 | 181.86 | Fd3 m | 8.181 | 148.00 | 96.20 | 91.88 | [30] |
| Gd | 1 | 0.02 | 1.98 | 4 | 1.2 | 182.86 | Fd3m | 8.238 | 148.00 | 112.11 | 105.00 | [31] |
| Gd | 1 | 0.04 | 1.96 | 4 | 1.2 | 184.91 | Fd3m | 8.230 | 148.00 | 104.21 | 99.47 | [31] |
| Gd | 1 | 0.08 | 1.92 | 4 | 1.2 | 189.00 | Fd3m | 8.212 | 148.00 | 82.89 | 79.74 | [31] |
| Al | 1 | 0.02 | 1.98 | 4 | 1.61 | 180.26 | Fd3m | ﻿8.235 | 50.00 | 127.81 | 124.11 | [31] |
| Al | 1 | 0.05 | 1.95 | 4 | 1.61 | 179.42 | Fd3m | ﻿8.222 | 50.00 | 117.54 | 117.24 | [32] |
| Al | 1 | 0.08 | 1.92 | 4 | 1.61 | 178.58 | Fd3m | ﻿8.217 | 50.00 | 118.09 | 116.54 | [32] |
| Al | 1 | 0.02 | 1.98 | 4 | 1.61 | 180.26 | Fd3m | ﻿8.243 | 20.00 | 126.71 | 109.99 | [33] |
| Al | 1 | 0.1 | 1.9 | 4 | 1.61 | 178.02 | Fd3m | ﻿8.228 | 20.00 | 95.09 | 84.50 | [33] |
| Ni | 1 | 0.5 | 1.5 | 4 | 1.91 | 182.69 | Fd3m | 8.176 | 148.00 | 113.20 | 109.23 | [34] |
| Ni | 1 | 0.5 | 1.5 | 4 | 1.91 | 182.69 | Fd3m | 8.182 | 75.00 | 122.65 | 119.44 | [35] |
| Ni | 1 | 0.5 | 1.5 | 4 | 1.91 | 182.69 | Fd3m | 8.179 | 75.00 | 127.10 | 123.77 | [35] |
| Ni | 1 | 0.5 | 1.5 | 4 | 1.91 | 182.69 | Fd3m | 8.176 | 75.00 | 130.70 | 130.64 | [35] |

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