|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| References | Energy band gap (eV) | Reaction temperature (C) | Calcination temperature (C) | Reaction hour (hr) | Calcination hour (hr) | Synthesis method | Precursor | pH | Precursor concentration (M) | Nanoparticle size (nm) |
| [1] | 3.375 | 50 | 500 |  | 1 | Sol-gel | Zinc nitrate | 9 | 0.165 | 21.82 |
| [2] | 3.377 | 100 |  | 6 |  | Hydrothermal | Zinc acetate | 8 | 0.1 | 18 |
| [2] | 3.787 | 80 | 450 | 5 | 6 | Sol-gel | Zinc acetate | 8 | 0.5 | 14 |
| [3] | 3.45 | 25 |  | 2 |  | Green | Zinc acetate | 12 | 0.5 | 21 |
| [4] | 2.57 |  |  |  |  | Green | Zinc nitrate |  |  | 41.23 |
| [5] | 3.5 | 25 | 300 | 6 | 0.75 | Green | Zinc acetate | 8 | 0.5 | 14.7 |
| [6] | 3.62 | 25 | 70 | 24 | 12 | Green | Zinc acetate | 7 | 2 | 15.2 |
| [7] | 3.1 | 80 |  | 5 |  | Green | Zinc nitrate | 7 | 0.3 | 35.8 |
| [7] | 3.12 | 80 |  | 5 |  | Green | Zinc nitrate | 7 | 0.3 | 30.83 |
| [7] | 3.07 | 80 |  | 5 |  | Green | Zinc nitrate | 7 | 0.3 | 33.1 |
| [8] | 3.23 | 25 |  | 2 |  | Sol-gel | Zinc acetate | 10 | 0.2 | 38.32 |
| [8] | 3.14 | 25 |  | 2 |  | Sol-gel | Zinc acetate | 11 | 0.2 | 36.65 |
| [9] | 3.33 | 25 | 400 | 4 |  | Sol-gel | Zinc acetate | 8 |  | 38.35 |
| [9] | 3.3 | 25 | 500 | 4 |  | Sol-gel | Zinc acetate | 8 |  | 39.28 |
| [10] | 3.43 | 30 | 80 | 7 | 10 | Sol-gel | Zinc acetate | 6 | 0.2 | 13.8 |
| [10] | 3.37 | 30 | 80 | 7 | 10 | Sol-gel | Zinc acetate | 8 | 0.2 | 18 |
| [10] | 3.32 | 30 | 80 | 7 | 10 | Sol-gel | Zinc acetate | 12 | 0.2 | 24.7 |
| [10] | 3.25 | 30 | 80 | 7 | 10 | Sol-gel | Zinc acetate | 13 | 0.2 | 33 |
| [11] | 3.31 | 25 | 100 | 2 | 12 | Sol-gel | Zinc acetate | 8 |  |  |
| [11] | 3.33 | 25 | 100 | 2 | 12 | Sol-gel | Zinc acetate | 9 |  |  |
| [11] | 3.3 | 25 | 100 | 2 | 12 | Sol-gel | Zinc acetate | 10 |  |  |
| [11] | 3.29 | 25 | 100 | 2 | 12 | Sol-gel | Zinc acetate | 11 |  | 46.45 |
| [12] | 3.375 | 25 | 100 | 3 | 4 | Green | Zinc acetate |  |  | 21.75 |
| [13] | 3.23 | 60 | 200 |  | 3 | Sol-gel | Zinc acetate | 8 |  | 28 |
| [13] | 3.22 | 60 | 400 |  | 3 | Sol-gel | Zinc acetate | 8 |  | 39 |
| [13] | 3.2 | 60 | 500 |  | 3 | Sol-gel | Zinc acetate | 8 |  | 44 |
| [14] | 3.56 | 25 | 60 | 2 | 12 | Green | Zinc acetate | 12 | 0.02 | 21.49 |
| [14] | 3.57 | 25 | 60 | 2 | 12 | Green | Zinc nitrate | 12 | 0.05 | 25.26 |
| [15] | 3.48 | 70 | 40 | 1 | 12 | Sol-gel | Zinc acetate | 9 | 0.1 | 22.37 |
| [15] | 3.47 | 70 | 40 | 1 | 12 | Sol-gel | Zinc acetate | 10 | 0.1 | 21.27 |
| [15] | 3.45 | 70 | 40 | 1 | 12 | Sol-gel | Zinc acetate | 11 | 0.1 | 19.39 |
| [15] | 3.38 | 70 | 40 | 1 | 12 | Sol-gel | Zinc acetate | 12 | 0.1 | 16.11 |
| [16] | 3.3 | 60 | 600 |  |  | Solvothermal | Zinc acetate |  | 0.01 | 21.5 |
| [17] | 3.23 | 25 | 600 |  | 3 | Solvothermal | Zinc nitrate |  |  | 14.24 |
| [17] | 3.14 | 25 | 700 |  | 3 | Solvothermal | Zinc nitrate |  |  | 16.2 |
| [17] | 3.12 | 25 | 800 |  | 3 | Solvothermal | Zinc nitrate |  |  | 28 |
| [18] | 3.13 | 120 | 500 | 0.3 |  | Sol-gel | Zinc acetate |  | 0.6 | 45.8 |
| [18] | 3.15 | 120 | 650 | 0.3 |  | Sol-gel | Zinc acetate |  | 0.6 | 48 |
| [19] | 2.99 | 80 | 400 | 2 | 2 | Solvothermal | Zinc acetate |  |  | 32.5 |
| [20] | 2.95 | 140 | 60 | 12 | 6 | Solvothermal | Zinc acetate | 7 | 0.1 | 38 |
| [21] | 3 | 80 | 100 | 12 | 12 | Solvothermal | Zinc acetate |  |  | 40.5 |
| [22] | 3.349 | 150 | 60 | 3 |  | Solvothermal | Zinc acetate | 9 | 0.1 | 28.79 |
| [22] | 3.88 | 150 | 60 | 12 |  | Solvothermal | Zinc acetate | 9 | 0.1 | 24.28 |
| [23] | 3.23 | 140 |  | 4 |  | Solvothermal | Zinc nitrate |  |  | 16.2 |
| [24] | 3.15 | 50 | 160 |  | 48 | Solvothermal | Zinc acetate | 7 |  | 46 |
| [25] | 3.27 | 60 | 170 | 0.5 | 18 | Solvothermal | Zinc acetate | 9 |  | 45 |
| [26] | 3.386 | 25 | 150 | 0.3 | 8 | Solvothermal | Zinc acetate |  | 0.1 | 24.2 |
| [26] | 3.401 | 25 | 150 | 0.3 | 8 | Solvothermal | Zinc acetate |  | 0.1 | 18.9 |
| [26] | 3.408 | 25 | 150 | 0.3 | 8 | Solvothermal | Zinc acetate |  | 0.1 | 14.7 |
| [27] | 3.246 | 60 |  | 24 |  | Solvothermal | Zinc acetate | 7 | 0.5 | 45.55 |
| [27] | 3.267 | 60 |  | 24 |  | Solvothermal | Zinc acetate | 7 | 0.5 | 42.05 |
| [28] | 3.42 |  |  |  |  | Solvothermal | Zinc acetate |  | 0.45 | 24.02 |
| [29] | 2.97 | 70 | 500 | 2 | 2 | Green | Zinc acetate | 4 |  | 27.38 |
| [29] | 3.69 | 70 | 500 | 2 | 2 | Green | Zinc acetate | 6 |  | 22.98 |
| [29] | 3.9 | 70 | 500 | 2 | 2 | Green | Zinc acetate | 9.5 |  | 25.39 |
| [29] | 3.97 | 70 | 500 | 2 | 2 | Green | Zinc acetate | 11 |  | 22.17 |
| [30] | 3.245 | 80 | 80 | 2 |  | Sol-gel | Zinc nitrate | 9 | 0.1 | 36.36 |
| [30] | 3.249 | 80 | 80 | 2 |  | Sol-gel | Zinc nitrate | 11 | 0.1 | 32.32 |
| [30] | 3.306 | 80 | 80 | 2 |  | Sol-gel | Zinc nitrate | 13 | 0.1 | 27.27 |
| [30] | 3.25 | 80 | 80 | 2 |  | Sol-gel | Zinc acetate | 11 | 0.1 | 31.16 |
| [30] | 3.245 | 80 | 80 | 2 |  | Sol-gel | Zinc acetate | 13 | 0.1 | 41.77 |
| [31] | 3.2 | 65 | 400 | 1 | 5 | Sol-gel | Zinc acetate |  | 0.15 | 16 |
| [32] | 2.7 | 80 | 150 | 3 | 2 | Green | Zinc nitrate | 8 | 0.1 | 35.202 |
| [32] | 2.692 | 80 | 250 | 3 | 2 | Green | Zinc nitrate | 8 | 0.1 | 35.203 |
| [32] | 2.672 | 80 | 350 | 3 | 2 | Green | Zinc nitrate | 8 | 0.1 | 42.249 |
| [32] | 2.645 | 80 | 450 | 3 | 2 | Green | Zinc nitrate | 8 | 0.1 | 43.308 |
| [33] | 3.349 | 80 | 400 | 12 | 2 | Sol-gel | Zinc nitrate |  | 0.5 | 24 |
| [33] | 3.295 | 80 | 500 | 12 | 2 | Sol-gel | Zinc nitrate |  | 0.5 | 33 |
| [33] | 3.278 | 80 | 600 | 12 | 2 | Sol-gel | Zinc nitrate |  | 0.5 | 44 |
| [34] | 3.274 | 90 | 400 | 2 | 8 | Sol-gel | Zinc acetate |  |  | 30.3 |
| [35] | 3.09 | 80 | 600 |  |  | Green | Zinc nitrate |  |  | 43.82 |
| [35] | 3.13 | 80 | 600 |  |  | Green | Zinc nitrate |  |  | 37.25 |
| [35] | 3.16 | 80 | 800 |  |  | Green | Zinc nitrate |  |  | 34.24 |
| [36] | 3.25 | 60 | 500 | 3 | 2 | Green | Zinc nitrate | 8 |  | 21.61 |
| [37] | 3.18 | 60 | 500 | 3 | 2 | Green | Zinc acetate | 8 |  | 36.75 |
| [38] | 3.79 | 80 | 500 | 2 | 4 | Sol-gel | Zinc nitrate | 7 |  | 40 |
| [38] | 3.16 | 25 | 80 |  | 12 |  | Zinc acetate | 5 |  | 18 |
| [38] | 3.19 | 25 | 80 |  | 12 |  | Zinc acetate | 7 |  | 21 |
| [38] | 3.18 | 25 | 80 |  | 12 |  | Zinc acetate | 8 |  | 23 |
| [38] | 3.17 | 25 | 80 |  | 12 |  | Zinc acetate | 10 |  | 20 |
| [38] | 3.19 | 25 | 80 |  | 12 |  | Zinc acetate | 7 |  | 23 |
| [38] | 3.18 | 25 | 80 |  | 12 |  | Zinc acetate | 8 |  | 20 |
| [38] | 3.15 | 25 | 80 |  | 12 |  | Zinc acetate | 10 |  | 20 |
| [39] | 3.15 | 25 | 80 |  | 12 |  | Zinc acetate | 12 |  | 20 |
| [39] | 3.39 | 25 | 80 | 0.5 | 12 | Solvothermal | Zinc nitrate |  | 0.5 | 24 |
| [39] | 3.32 | 25 | 80 | 0.5 | 12 | Solvothermal | Zinc nitrate |  | 0.5 | 23 |
| [40] | 3.4 | 25 | 80 | 0.5 | 12 | Solvothermal | Zinc nitrate |  | 0.5 | 20 |
| [40] | 3.236 | 80 | 80 | 12 |  | Solvothermal | Zinc acetate | 7 | 0.45 | 42.13 |
| [41] | 3.234 | 80 | 80 | 12 |  | Solvothermal | Zinc acetate | 7 | 0.45 | 45.14 |
| [41] | 3.216 | 140 | 60 | 1 | 24 | Hydrothermal | Zinc acetate | 9 | 0.4 | 33.67 |
| [41] | 3.213 | 140 | 60 | 1 | 24 | Hydrothermal | Zinc acetate | 9 | 0.4 | 35.34 |
| [42] | 3.22 | 160 | 60 | 1.5 | 24 | Hydrothermal | Zinc acetate | 9 | 0.4 | 43.04 |
| [43] | 3.47 | 25 | 50 | 2 | 48 | Green | Zinc acetate | 12 | 0.15 | 19.51 |
| [44] | 3.29 | 70 | 380 | 1 | 1 | Sol-gel | Zinc acetate |  |  | 30.6 |
| [45] | 3.27 | 120 | 450 | 3 | 2 | Sol-gel | Zinc acetate | 6 | 0.6 | 24 |
| [45] | 3.05 | 25 | 60 | 2 | 12 | Green | Zinc acetate | 10 | 0.02 | 40 |
| [45] | 3.08 | 25 | 60 | 2 | 12 | Green | Zinc acetate | 11 | 0.02 | 33.3 |
| [46] | 3.14 | 25 | 60 | 2 | 12 | Green | Zinc acetate | 12 | 0.02 | 30.7 |
| [46] | 3.42 | 80 | 400 |  | 1 | Green | Zinc nitrate |  | 0.4 | 12.5 |
| [46] | 3.38 | 80 | 600 |  | 1 | Green | Zinc nitrate |  | 0.4 | 20 |
| [47] | 3.35 | 80 | 800 |  | 1 | Green | Zinc nitrate |  | 0.4 | 22.5 |
| [47] | 3.23 | 35 | 250 | 0.3 | 4 | Sol-gel | Zinc acetate |  | 0.6 | 33.2 |
| [48] | 3.25 | 35 | 250 | 0.3 | 4 | Green | Zinc acetate |  |  | 25.97 |
| [49] | 3.15 | 90 | 700 |  | 4 | Sol-gel | Zinc nitrate | 5 |  | 40 |
| [49] | 3.26 | 25 | 90 | 2 | 24 | Hydrothermal | Zinc nitrate | 12 | 1 | 21.13 |
| [49] | 3.25 | 25 | 190 | 2 | 24 | Hydrothermal | Zinc nitrate | 12 | 1 | 28.59 |
| [50] | 3.23 | 25 | 550 | 2 | 24 | Hydrothermal | Zinc nitrate | 12 | 1 | 32.41 |
| [51] | 3.21 | 70 | 450 | 1 | 4 | Sol-gel | Zinc acetate | 8 | 0.15 | 19.32 |
| [51] | 3.19 | 30 | 400 | 1 | 2 | Sol-gel | Zinc acetate |  | 0.25 | 25 |
| [52] | 3.12 | 30 | 400 | 1 | 2 | Sol-gel | Zinc acetate |  | 0.25 | 27 |
| [52] | 3.3 | 50 | 300 |  |  | Sol-gel |  |  | 0.3 |  |
| [53] | 3.269 | 60 | 400 |  | 2 | Sol-gel | Zinc acetate |  | 0.15 | 21.76 |
| [53] | 3.257 | 60 | 500 |  | 2 | Sol-gel | Zinc acetate |  | 0.15 | 25.72 |
| [53] | 3.359 | 60 | 600 |  | 2 | Sol-gel | Zinc acetate |  | 0.15 | 31.42 |
| [53] | 3.356 | 60 | 700 |  | 2 | Sol-gel | Zinc acetate |  | 0.15 | 35.42 |
| [54] | 3.11 |  | 500 |  | 2 | Sol-gel | Zinc acetate |  | 0.25 | 27.92 |
| [54] | 3.12 |  | 500 |  | 2 | Sol-gel | Zinc acetate |  | 0.25 | 37.14 |
| [54] | 3.08 |  | 500 |  | 2 | Sol-gel | Zinc acetate |  | 0.25 | 34 |
| [55] | 3.18 | 60 | 400 | 1 | 2 | Sol-gel | Zinc nitrate | 12 | 0.1 | 17 |
| [56] | 3.28 | 40 | 450 | 2 | 4 | Sol-gel | Zinc nitrate | 7 | 0.2 | 24.7 |
| [57] | 3.29 | 75 | 500 | 8 |  | Sol-gel | Zinc nitrate |  |  | 49 |
| [58] | 3.81 | 25 | 100 | 4 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [58] | 3.8 | 25 | 300 | 4 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [58] | 3.56 | 25 | 100 | 8 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [58] | 3.49 | 25 | 300 | 8 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [58] | 3.42 | 25 | 100 | 12 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [58] | 3.36 | 25 | 300 | 12 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [58] | 3.34 | 25 | 100 | 16 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [58] | 3.12 | 25 | 300 | 16 | 4 | Sol-gel | Zinc acetate |  | 0.1 |  |
| [59] | 3.31 | 80 | 400 | 10 | 8 | Sol-gel | Zinc nitrate |  |  | 21 |
| [59] | 3.28 | 80 | 500 | 10 | 8 | Sol-gel | Zinc nitrate |  |  | 36 |
| [59] | 3.28 | 80 | 600 | 10 | 8 | Sol-gel | Zinc nitrate |  |  | 42 |
| [60] | 3.09 | 25 | 300 |  |  | Sol-gel | Zinc acetate |  |  | 27.9 |
| [61] | 3.15 | 60 | 400 | 1 | 1 | Sol-gel | Zinc acetate |  | 0.35 | 24.7 |
| [61] | 2.96 | 60 | 500 | 1 | 1 | Sol-gel | Zinc acetate |  | 0.35 | 40.45 |
| [62] | 4.1 | 32 | 85 |  | 24 | Green | Zinc nitrate | 12 | 0.1 | 18 |
| [62] | 3.78 | 32 | 85 |  | 24 | Green | Zinc acetate | 12 | 0.1 | 20 |
| [63] | 2.69 | 60 | 400 | 1 | 1 | Green | Zinc nitrate |  |  | 38.63 |
| [64] | 2.7 | 25 | 100 | 8 | 2 | Sol-gel | Zinc acetate | 8 | 0.75 | 28 |
| [64] | 2.87 | 25 | 100 | 8 | 2 | Sol-gel | Zinc acetate | 9 | 0.75 | 25 |
| [64] | 3.31 | 25 | 100 | 8 | 2 | Sol-gel | Zinc acetate | 10 | 0.75 | 29 |
| [64] | 3.47 | 25 | 100 | 8 | 2 | Sol-gel | Zinc acetate | 11 | 0.75 | 35 |
| [65] | 3.42 |  | 100 | 2 | 8 | Sol-gel | Zinc acetate |  | 0.5 | 42.63 |
| [66] | 3 | 65 | 400 | 0.6 | 2 | Green | Zinc nitrate |  | 0.01 | 32.32 |
| [67] | 3.179 | 80 | 600 | 6 | 2 | Sol-gel | Zinc nitrate |  |  | 22.99 |
| [68] | 3 | 70 | 600 | 2 | 2 | Green | Zinc nitrate | 4.5 |  | 18.82 |
| [69] | 3.24 | 60 | 500 | 3 | 2 |  | Zinc nitrate |  | 0.1 | 35 |
| [70] | 3.75 | 85 | 350 | 2 | 2 | Green | Zinc acetate | 10 | 0.05 | 46.5 |
| [71] |  | 60 | 350 | 1 | 3 | Green | Zinc acetate |  | 0.2 | 36 |

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