**Table 1.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Cluster** | **Cathode material** | **Pt NP size (nm)**  | **Pt (wt%)** | **Pt surface area (m2/g)** | **cathode surface area without Pt (m2/g)** | **Cathode total surface area (m2/g)** | **ECSA (m2/g)** |
| 1 [6] | Pt | 3 | 100 | 66 | 66 | 66 | 13 |
| 2 [7] | rGO-Pt (H100) | 2.9 | 25.2 | 24.3067 | 41 | 54.9742 | 60 |
| rGO-CB-Pt (H90) | 2.6 | 16.2 | 17.4287 | 57 | 65.1937 | 67 |
| rGO-CB-Pt (H80) | 2.3 | 18.4 | 22.3776 | 73 | 81.9454 | 60 |
| rGO-CB-Pt (H70) | 1.9 | 18.7 | 27.5303 | 87 | 98.2587 | 67 |
| rGO-CB-Pt (H60) | 2.6 | 21.4 | 23.0231 | 105 | 105.5516 | 61 |
| rGO-CB-Pt (H50) | 2.4 | 15 | 17.4825 | 122 | 121.1825 | 56 |
| 3 | CB-Pt [6] | 3 | 50 | 46.6186 | 208 | 150.6186 | 19 |
| CB-Pt [8] | 2 | 30 | 41.958 | 208 | 192.2753 | 50 |
| CB-Pt [7] | 2.4 | 6 | 6.9929 | 208 | 202.5125 | 65.7 |
| 4 [9] | GNP-CB-Pt (H50) | 1.85 | 16.3 | 24.6456 | 397 | 356.9346 | 45.58 |
| GNP-CB-Pt (H60) | 2.1 | 18.2 | 24.2424 | 485 | 420.9724 | 48.13 |
| GNP-CB-Pt (H70) | 2.04 | 19.2 | 26.3266 | 485 | 418.2066 | 44.73 |
| GNP-CB-Pt (H80) | 1.84 | 21.2 | 32.2286 | 505 | 430.1686 | 52.24 |
| GNP-CB-Pt (H90) | 2.05 | 22.5 | 30.701 | 650 | 534.451 | 45.75 |
| GNP-Pt (H100) | 1.7 | 22.8 | 37.5154 | 759 | 623.4634 | 49.66 |

**Table 2.**

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**Table 3.**

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**Table 4. **

**Table 5. **