Table 5. The best obtained results for Quinary system using **GA** and **PSO**.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **System** | **Model** |  | **GA** | | **PSO** | |  | |
|  |  |  |  | GA | PSO |
| Ethanol (**1**)  Water (**2**)  Pentane (**3**)  Hexane (**4**)  Cyclohexane (**5**) | Wilson | 1-2 | -6.07 | -521.09 | -10.10 | 500.91 | 13.96 | 12.88 |
| 1-3 | -441.56 | 394.36 | -500.15 | 450.22 |
| 1-4 | -85.94 | 937.08 | -100.23 | 850.01 |
| 1-5 | -1308.84 | 1626.54 | -1420.23 | 1600.23 |
| 2-3 | 1849.03 | 172.72 | 1900.05 | 155.48 |
| 2-4 | 1824.90 | 1603.06 | 1745.85 | 1450.07 |
| 2-5 | -1319.37 | 1910.68 | -937.98 | 1850.55 |
| 3-4 | 1859.23 | -1145.42 | 1752.69 | -1000.00 |
| 3-5 | 976.78 | -1210.19 | 1000.00 | -1300.09 |
| 4-5 | -1425.02 | 874.66 | -1528.09 | 910.04 |
|  | | | | | | | |
| UNIQUAC | 1-2 | -90.67 | -410.99 | -100.39 | -362.17 | 1.99 | 2.01 |
| 1-3 | -401.20 | 500.00 | -396.57 | 487.91 |
| 1-4 | -300.66 | 1000.19 | -215.10 | 1097.39 |
| 1-5 | -976.28 | 1279.81 | -800.02 | 1360.09 |
| 2-3 | 1847.09 | 1500.08 | 1900.17 | 1515.24 |
| 2-4 | 1603.97 | 1309.78 | 1597.38 | 1200.99 |
| 2-5 | -1000.00 | 1410.08 | -990.99 | 1390.72 |
| 3-4 | 1207.09 | -500.77 | 1300.08 | -390.22 |
| 3-5 | 1100.10 | -1315.92 | 1238.90 | -1200.33 |
| 4-5 | -490.69 | 210.08 | -507.88 | 200.87 |
|  | | | | | | | |
| NRTL | 1-2 | -171.67 | -493.45 | -180.99 | -502.67 | 2.11 | 2.07 |
| 1-3 | -615.61 | 973.24 | -600.08 | 1000.01 |
| 1-4 | -369.38 | 1586.75 | -419.78 | 1600.07 |
| 1-5 | -975.98 | 1560.03 | -1001.98 | 1708.10 |
| 2-3 | 1047.10 | 1878.92 | 1010.96 | 1901.37 |
| 2-4 | 1073.21 | 1721.59 | 1129.84 | 1827.19 |
| 2-5 | -1349.62 | 1870.14 | -1428.98 | 1754.72 |
| 3-4 | 1235.19 | -875.79 | 1338.99 | -1000.00 |
| 3-5 | 1353.25 | -1556.19 | 1420.02 | -1500.10 |
| 4-5 | -915.35 | 358.11 | -956.37 | 428.01 |