Details of DESs, HBAs, and HBDs and the phase condition

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DES | HBA | HBD | The molar ratio (HBA: HBD) | **Avg. Mol. Weight (gm.mol-1)** | Observed phase  after 24 hrs. | Estimated Values | | | | | |
| **MCI** | **Tbm** | **Tcm** | **Vcm** | **Pcm** | **ωm** |
| DES1\* | ChCl | EG | 1:1 | - | Solid | - | - | - | - | - | - |
| DES2\* | ChCl | EG | 1:2 | 87.66 | Semi solid | 1.7208 | 439 | 610.73 | 290.69 | 59.92 | 0.94 |
| DES3 | ChCl | EG | 1:3 | 81.46 | Liquid | 2.1223 | 437 | 610.73 | 290.69 | 61.84 | 0.96 |
| DES4 | ChCl | EG | 1:4 | 77.58 | Liquid | 2.5238 | 435 | 610.73 | 290.69 | 62.97 | 0.96 |
| DES5 | ChCl | EG | 1:5 | 74.48 | Liquid | 2.9253 | 434 | 610.73 | 290.69 | 63.72 | 0.97 |
| DES6 | ChCl | Gly | 1:1 | 115.87 | Liquid | 1.6070 | 501 | 667.86 | 339.12 | 54.02 | 1.15 |
| DES7 | ChCl | Gly | 1:2 | 107.78 | Liquid | 2.2963 | 515 | 667.86 | 339.12 | 57.05 | 1.25 |
| DES8 | ChCl | Gly | 1:3 | 103.98 | Liquid | 2.9856 | 523 | 667.86 | 339.12 | 58.61 | 1.30 |
| DES9 | ChCl | Gly | 1:4 | 101.61 | Liquid | 3.6749 | 527 | 667.86 | 339.12 | 59.53 | 1.33 |
| DES10 | ChCl | Gly | 1:5 | 99.70 | Liquid | 4.3641 | 530 | 667.86 | 339.12 | 60.13 | 1.36 |
| DES11\* | ChCl | TEG | 1:1 | 144.91 | Semi solid | 2.1383 | 512 | 680.77 | 438.33 | 39.70 | 0.97 |
| DES12 | ChCl | TEG | 1:2 | 146.70 | Liquid | 3.3588 | 530 | 680.77 | 438.33 | 38.00 | 1.02 |
| DES13 | ChCl | TEG | 1:3 | 147.54 | Liquid | 4.5794 | 539 | 680.77 | 438.33 | 37.12 | 1.04 |
| DES14 | ChCl | TEG | 1:4 | 148.07 | Liquid | 5.7999 | 544 | 680.77 | 438.33 | 36.61 | 1.05 |
| DES15 | ChCl | TEG | 1:5 | 148.49 | Liquid | 7.0204 | 548 | 680.77 | 438.33 | 36.27 | 1.06 |
| DES16\* | MTPB | EG | 1:1 | Solid | Solid | - | - | - | - | - | - |
| DES17 | MTPB | EG | 1:2 | 159.48 | Liquid | 3.9860 | 548 | 791.44 | 441.08 | 52.50 | 0.90 |
| DES18 | MTPB | EG | 1:3 | 135.86 | Liquid | 4.3875 | 518 | 791.44 | 441.08 | 56.30 | 0.93 |
| DES19 | MTPB | EG | 1:4 | 121.10 | Liquid | 4.7890 | 500 | 791.44 | 441.08 | 58.54 | 0.94 |
| DES20 | MTPB | EG | 1:5 | 109.30 | Liquid | 5.1905 | 489 | 791.44 | 441.08 | 60.02 | 0.95 |
| DES21\* | MTPB | Gly | 1:1 | Solid | Solid | - | - | - | - | - | - |
| DES22\* | MTPB | Gly | 1:2 | 179.60 | Liquid with crystals | 4.5615 | 624 | 865.48 | 504.61 | 49.63 | 1.21 |
| DES23 | MTPB | Gly | 1:3 | 158.39 | Liquid | 5.2508 | 604 | 865.48 | 504.61 | 53.07 | 1.27 |
| DES24 | MTPB | Gly | 1:4 | 145.13 | Liquid | 5.9401 | 592 | 865.48 | 504.61 | 55.10 | 1.31 |
| DES25 | MTPB | Gly | 1:5 | 134.52 | Liquid | 6.6294 | 584 | 865.48 | 504.61 | 56.43 | 1.34 |
| DES26\* | MTPB | TEG | 1:1 | Solid | Solid | - | - | - | - | - | - |
| DES27 | MTPB | TEG | 1:2 | 218.50 | Liquid | 5.6241 | 639 | 882.21 | 632.52 | 30.58 | 0.98 |
| DES28 | MTPB | TEG | 1:3 | 201.94 | Liquid | 6.8446 | 620 | 882.21 | 632.52 | 31.59 | 1.01 |
| DES29 | MTPB | TEG | 1:4 | 191.58 | Liquid | 8.0651 | 609 | 882.21 | 632.52 | 32.18 | 1.03 |
| DES30 | MTPB | TEG | 1:5 | 183.30 | Liquid | 9.2857 | 602 | 882.21 | 632.52 | 32.57 | 1.04 |
| DES31\* | TBAB | EG | 1:1 | Solid | Solid | - | - | - | - | - | - |
| DES32 | TBAB | EG | 1:2 | 147.97 | Liquid | 3.1245 | 502 | 700.38 | 496.39 | 49.82 | 0.95 |
| DES33 | TBAB | EG | 1:3 | 127.15 | Liquid | 3.5260 | 484 | 700.38 | 496.39 | 54.31 | 0.96 |
| DES34 | TBAB | EG | 1:4 | 114.13 | Liquid | 3.9275 | 473 | 700.38 | 496.39 | 56.95 | 0.97 |
| DES35 | TBAB | EG | 1:5 | 103.72 | Liquid | 4.3290 | 466 | 700.38 | 496.39 | 58.69 | 0.97 |
| DES36\* | TBAB | Gly | 1:1 | 128.94 | Liquid | 3.0108 | 595 | 765.90 | 565.00 | 38.96 | 1.16 |
| DES37 | TBAB | Gly | 1:2 | 138.15 | Liquid | 3.7000 | 578 | 765.90 | 565.00 | 46.96 | 1.26 |
| DES38 | TBAB | Gly | 1:3 | 149.67 | Liquid | 4.3893 | 570 | 765.90 | 565.00 | 51.08 | 1.31 |
| DES39 | TBAB | Gly | 1:4 | 168.09 | Liquid | 5.0786 | 565 | 765.90 | 565.00 | 53.50 | 1.34 |
| DES40 | TBAB | Gly | 1:5 | 207.24 | Liquid | 5.7679 | 561 | 765.90 | 565.00 | 55.10 | 1.36 |
| DES41\* | TBAB | TEG | 1:1 | 236.27 | Liquid | 3.5420 | 606 | 780.70 | 702.54 | 24.64 | 0.99 |
| DES42 | TBAB | TEG | 1:2 | 207.00 | Liquid | 4.7626 | 593 | 780.70 | 702.54 | 27.91 | 1.03 |
| DES43 | TBAB | TEG | 1:3 | 193.22 | Liquid | 5.9831 | 586 | 780.70 | 702.54 | 29.59 | 1.05 |
| DES44 | TBAB | TEG | 1:4 | 184.61 | Liquid | 7.2036 | 582 | 780.70 | 702.54 | 30.58 | 1.06 |
| DES45 | TBAB | TEG | 1:5 | 177.72 | Liquid | 8.4242 | 579 | 780.70 | 702.54 | 31.24 | 1.07 |
| \*DESs synthesized twice | | | | | |  |  |  |  |  |  |

* ChCl: Choline Chloride
* MTPB: Methyl Triphenyl Bromide
* TBAB: Tetrabutylammonium bromide
* Gly: Glycerol
* EG: Ethylene Glycol
* TEG: Tri Ethylene Glycol

Details of experimental data points (for 40 DESs, 5 that were solidified were not considered)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Property | No. of data points | Temperature range | Min. | Max. |
| Density (gmcc-1) | 494 | 308.15-353.15 K. | 1.0622 (TAAB:EG 1:2) at 309 | 1.2929 (MTPB:Glycerol 1:2) at 309K |
| Viscosity (Pa. s) | 1600 | 293.15-323.15 K. | 0.0429 (ChCl:EG 1:5) at 298 | 3.9021 (MTPB:Glycerol 1:2) at 298 |
| Conductivity (mS.cm-1) | 240 | 298.15-323.15 K | 0.018 (TBAB GLy 1:5) at 298 | 7.68 (ChCl: EG 1:2) at 298 |