*УДК 544.31*

# ТЕРМОДИНАМИЧЕСКИЕ СВОЙСТВА ТИТАНАТА ГАДОЛИНИЯ $Gd_2Ti_2O_7$

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## Supplements

## Figures

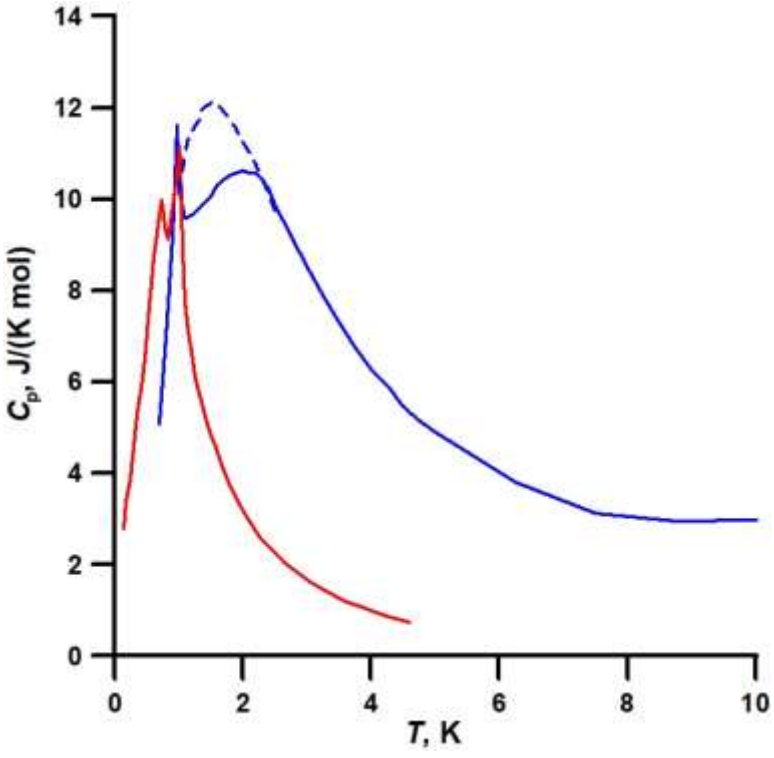

Fig.S1. Heat capacity of $Gd_2Ti_2O_7$ in the region below 10 K: blue line – [12], red line – [13].

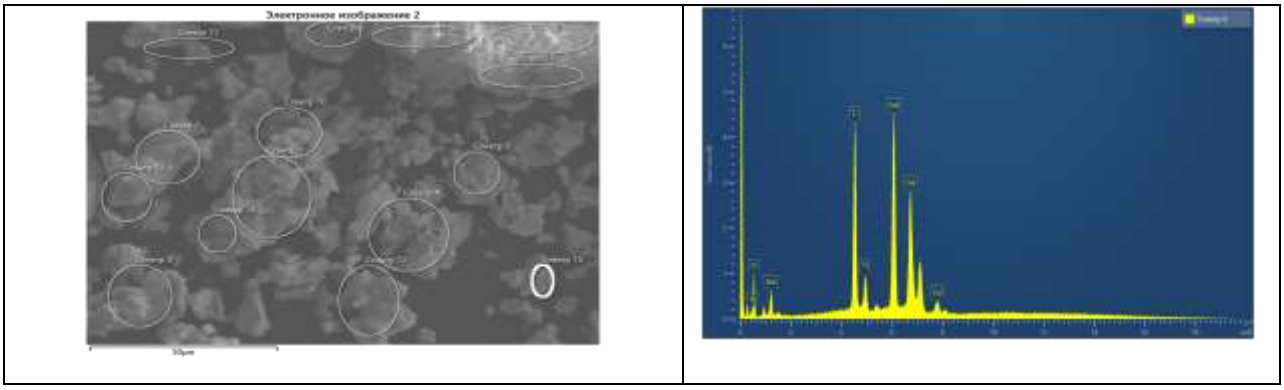

Fig. S2. EDX data for $Gd_2Ti_2O_7$ specimen.

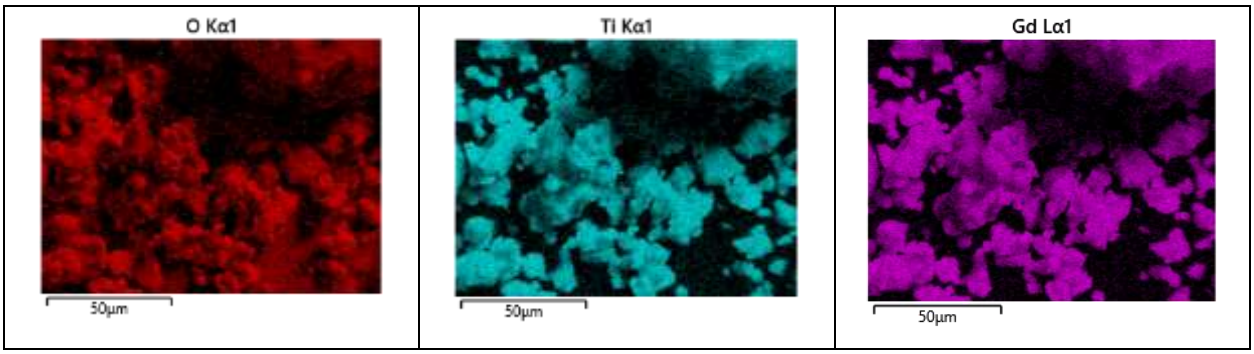


Fig.S3. Mapping of $Gd_2Ti_2O_7$ surface.

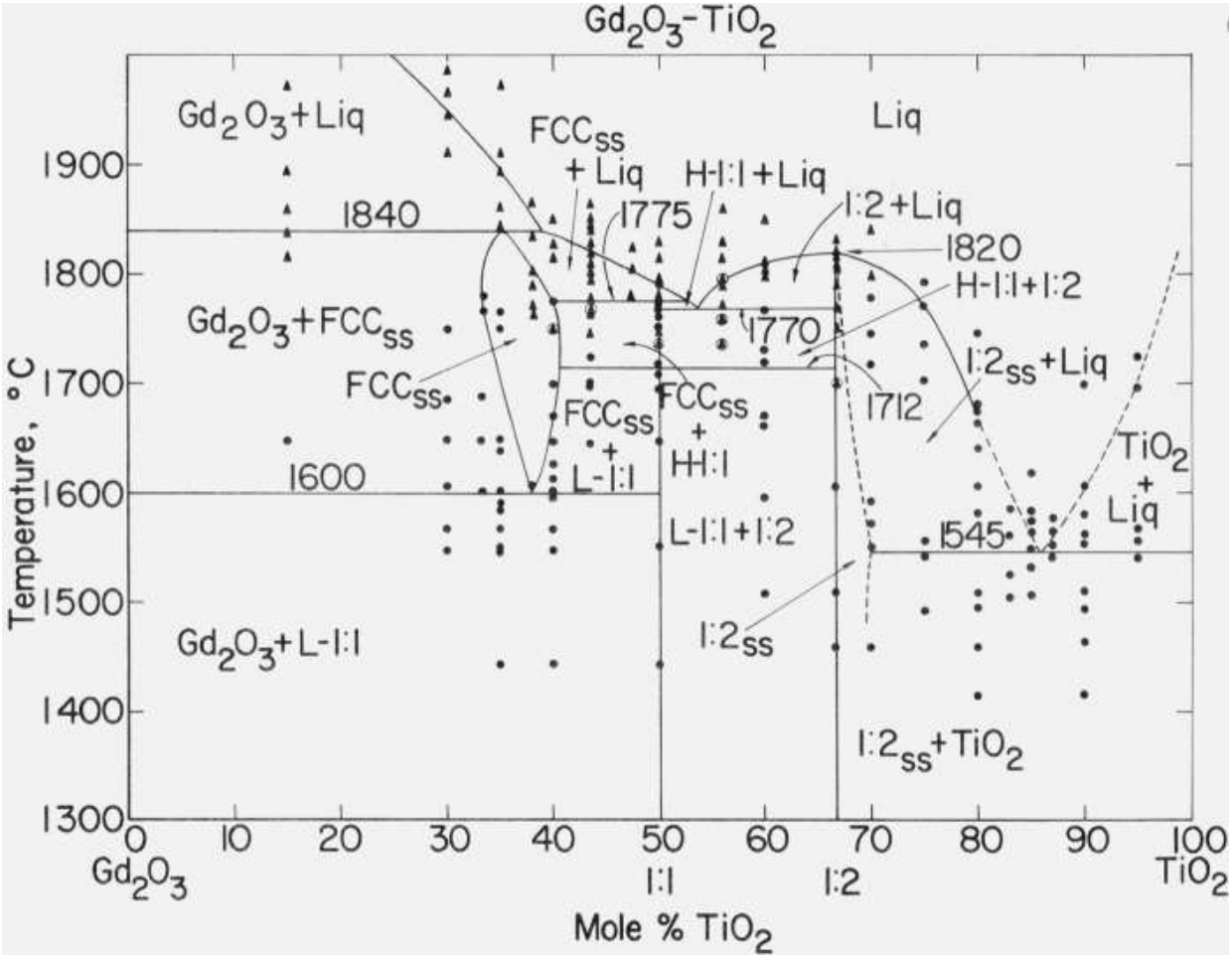


Fig.S4. Phase diagram $Gd_2O_3$-$TiO_2$ after [29].

**Tables**

Table S1. Experimental heat capacity of $Gd_2Ti_2O_7$ measured by relaxation calorimetry, in J/(K mol). Sample mass 0.00976 g.

| $T$, K | $C_p$ | $T$, K | $C_p$ | $T$, K | $C_p$ | $T$, K | $C_p$ |
|---|---|---|---|---|---|---|---|
| 2.08 | 11.74 | 4.79 | 5.965 | 11.04 | 3.004 | 25.41 | 14.08 |
| 2.24 | 11.07 | 5.16 | 5.402 | 12.00 | 3.150 | 27.47 | 15.45 |
| 2.42 | 10.86 | 5.57 | 5.035 | 12.91 | 3.384 | 29.62 | 17.69 |
| 2.61 | 10.18 | 6.01 | 4.776 | 13.93 | 3.806 | 31.95 | 20.15 |
| 2.82 | 9.642 | 6.47 | 4.405 | 15.03 | 4.432 | 34.46 | 22.60 |
| 3.04 | 9.002 | 7.02 | 3.779 | 16.20 | 5.138 | 37.18 | 24.65 |
| 3.28 | 8.396 | 7.54 | 3.491 | 17.44 | 6.155 | 39.91 | 28.59 |
| 3.54 | 7.922 | 8.14 | 3.294 | 18.76 | 6.799 | 40.08 | 29.00 |
| 3.81 | 7.363 | 8.77 | 3.075 | 20.21 | 9.206 | | |
| 4.11 | 6.807 | 9.46 | 2.921 | 21.81 | 10.66 | | |
| 4.44 | 6.342 | 10.21 | 2.913 | 23.57 | 12.40 | | |

Table S2. Experimental heat capacity of $Gd_2Ti_2O_7$ measured by adiabatic calorimetry, in J/(Kmol). Sample mass 3.16865 g. Series 1.

| $T$, K | $C_p$ | $T$, K | $C_p$ | $T$, K | $C_p$ |
|---|---|---|---|---|---|
| 5.64 | 4.835 | 57.01 | 45.16 | 176.40 | 156.8 |
| 5.86 | 4.580 | 58.91 | 47.07 | 180.31 | 159.4 |
| 6.32 | 4.225 | 60.81 | 48.97 | 184.21 | 161.7 |
| 6.85 | 3.820 | 62.73 | 50.82 | 188.12 | 163.8 |
| 7.35 | 3.533 | 64.64 | 52.85 | 192.15 | 166.0 |
| 7.87 | 3.296 | 66.56 | 54.66 | 196.10 | 168.0 |
| 8.37 | 3.076 | 68.47 | 56.55 | 200.04 | 169.9 |
| 8.87 | 2.922 | 70.40 | 58.39 | 203.98 | 173.1 |
| 9.37 | 2.829 | 72.32 | 60.88 | 207.91 | 175.4 |
| 9.86 | 2.785 | 74.24 | 62.87 | 211.82 | 177.7 |
| 10.63 | 2.774 | 76.17 | 65.02 | 215.74 | 179.9 |
| 11.58 | 2.868 | 78.10 | 67.18 | 219.63 | 182.0 |
| 12.45 | 3.066 | 78.62 | 68.59 | 223.46 | 184.0 |
| 13.34 | 3.373 | 80.02 | 69.16 | 227.35 | 186.1 |
| 14.23 | 3.755 | 81.98 | 71.09 | 231.31 | 186.4 |
| 15.10 | 4.235 | 83.92 | 72.79 | 235.22 | 189.1 |
| 15.99 | 4.798 | 85.87 | 74.65 | 239.12 | 191.8 |
| 16.87 | 5.415 | 87.81 | 77.37 | 243.00 | 193.9 |
| 17.75 | 6.123 | 89.76 | 79.40 | 246.88 | 195.5 |
| 18.64 | 6.868 | 91.70 | 81.34 | 250.76 | 197.1 |
| 19.54 | 7.617 | 93.65 | 83.26 | 254.62 | 198.5 |
| 20.43 | 8.451 | 95.60 | 85.19 | 258.48 | 200.1 |
| 21.58 | 9.534 | 97.56 | 87.22 | 262.33 | 201.6 |
| 22.90 | 10.71 | 99.52 | 89.13 | 266.16 | 203.1 |
| 24.20 | 12.05 | 102.46 | 91.61 | 269.97 | 204.5 |
| 25.53 | 13.34 | 106.34 | 95.56 | 273.79 | 205.9 |
| 26.86 | 14.66 | 110.18 | 99.28 | 277.58 | 207.1 |
| 28.21 | 15.94 | 114.04 | 103.1 | 281.35 | 208.5 |
| 29.55 | 17.24 | 117.91 | 106.8 | 285.11 | 209.7 |
| 31.18 | 19.31 | 121.79 | 110.5 | 288.85 | 210.9 |
| 33.01 | 21.27 | 125.68 | 114.2 | 292.58 | 212.0 |
| 34.79 | 22.76 | 129.57 | 117.7 | 296.29 | 213.0 |
| 36.59 | 24.65 | 133.46 | 121.4 | 299.97 | 214.1 |
| 38.39 | 26.30 | 137.36 | 124.9 | 303.64 | 215.3 |
| 40.21 | 28.17 | 141.26 | 128.5 | 307.29 | 216.3 |
| 42.04 | 29.83 | 145.16 | 132.0 | 310.91 | 217.1 |
| 43.88 | 31.61 | 149.06 | 135.4 | 314.51 | 218.1 |
| 45.73 | 33.46 | 152.97 | 138.8 | 318.09 | 219.2 |
| 47.59 | 35.14 | 156.87 | 142.0 | 321.64 | 220.1 |
| 49.46 | 37.27 | 160.78 | 145.1 | 325.17 | 221.0 |

| | | | | | |
|---|---|---|---|---|---|
| 51.36 | 39.40 | 164.68 | 148.2 | 328.67 | 221.9 |
| 53.25 | 41.23 | 168.59 | 151.2 | | |
| 55.12 | 43.10 | 172.50 | 154.0 | | |

Table S3. Experimental heat capacity of $Gd_2Ti_2O_7$ measured by adiabatic calorimetry, in J/(Kmol). Series 2.

| *T*, K | $C_p$ | *T*, K | $C_p$ | *T*, K | $C_p$ |
|---|---|---|---|---|---|
| 6.08 | 4.392 | 57.76 | 45.21 | 172.46 | 152.3 |
| 6.47 | 4.030 | 59.66 | 47.17 | 176.37 | 155.2 |
| 7.02 | 3.683 | 61.56 | 49.24 | 180.28 | 158.0 |
| 7.51 | 3.411 | 63.47 | 51.07 | 184.19 | 160.6 |
| 8.03 | 3.167 | 65.38 | 53.04 | 188.09 | 163.1 |
| 8.54 | 2.989 | 67.30 | 54.96 | 192.13 | 165.4 |
| 9.04 | 2.851 | 69.22 | 56.97 | 196.09 | 167.8 |
| 9.53 | 2.770 | 71.15 | 58.78 | 200.03 | 170.7 |
| 10.01 | 2.708 | 73.08 | 60.78 | 203.97 | 173.1 |
| 10.81 | 2.730 | 75.00 | 62.60 | 207.90 | 175.4 |
| 11.78 | 2.855 | 76.93 | 64.74 | 211.82 | 177.7 |
| 12.64 | 3.090 | 78.86 | 66.83 | 215.74 | 179.9 |
| 13.53 | 3.426 | 78.62 | 67.20 | 219.65 | 182.0 |
| 14.41 | 3.855 | 79.99 | 68.47 | 223.48 | 184.0 |
| 15.29 | 4.365 | 81.95 | 70.35 | 227.37 | 186.0 |
| 16.17 | 4.922 | 83.89 | 72.05 | 231.33 | 187.0 |
| 17.05 | 5.559 | 85.83 | 73.91 | 235.24 | 189.3 |
| 17.93 | 6.258 | 87.78 | 76.50 | 239.14 | 191.6 |
| 18.82 | 6.997 | 89.72 | 78.40 | 243.04 | 193.5 |
| 19.72 | 7.769 | 91.67 | 80.25 | 246.93 | 194.9 |
| 20.90 | 8.823 | 93.62 | 82.11 | 250.82 | 196.4 |
| 22.22 | 10.07 | 95.57 | 84.04 | 254.70 | 197.9 |
| 23.49 | 11.31 | 97.53 | 85.99 | 258.57 | 199.3 |
| 24.80 | 12.65 | 99.48 | 87.91 | 262.43 | 200.9 |
| 26.12 | 13.96 | 102.40 | 90.86 | 266.28 | 202.4 |
| 27.46 | 15.29 | 106.28 | 94.84 | 270.12 | 203.9 |
| 28.81 | 16.64 | 110.13 | 98.61 | 273.95 | 205.4 |
| 30.17 | 18.06 | 113.99 | 102.5 | 277.76 | 207.0 |
| 31.81 | 19.77 | 117.87 | 106.3 | 281.56 | 208.4 |
| 33.65 | 21.56 | 121.75 | 110.1 | 285.35 | 209.7 |
| 35.45 | 23.20 | 125.63 | 113.7 | 289.11 | 211.1 |
| 37.25 | 25.12 | 129.52 | 117.3 | 292.87 | 212.3 |
| 39.06 | 26.94 | 133.41 | 120.7 | 296.61 | 213.5 |
| 40.90 | 28.72 | 137.31 | 124.1 | 300.34 | 214.5 |
| 42.74 | 30.35 | 141.21 | 127.4 | 304.04 | 215.6 |

| | | | | | |
|---|---|---|---|---|---|
| 44.59 | 32.17 | 145.10 | 130.6 | 307.72 | 216.6 |
| 46.46 | 34.02 | 149.00 | 133.9 | 311.38 | 217.5 |
| 48.31 | 35.79 | 152.92 | 137.0 | 315.02 | 218.5 |
| 50.18 | 37.77 | 156.82 | 140.1 | 318.64 | 219.4 |
| 52.08 | 39.70 | 160.72 | 143.2 | 322.24 | 220.3 |
| 53.98 | 41.48 | 164.63 | 146.3 | 325.81 | 221.1 |
| 55.86 | 43.34 | 168.54 | 149.3 | 329.36 | 221.6 |

Table 4. Experimental heat capacity of $Gd_2Ti_2O_7$, measured by differential scanning calorimetry, in J/(K mol). Sample mass 0.05831 g.

| *T*, K | $C_p$ | *T*, K | $C_p$ | *T*, K | $C_p$ | *T*, K | $C_p$ |
|---|---|---|---|---|---|---|---|
| 315 | 218.35 | 695 | 260.50 | 1075 | 273.35 | 1455 | 285.45 |
| 325 | 220.81 | 705 | 260.58 | 1085 | 274.75 | 1465 | 285.87 |
| 335 | 223.03 | 715 | 260.83 | 1095 | 275.37 | 1475 | 285.90 |
| 345 | 225.14 | 725 | 261.94 | 1105 | 275.27 | 1485 | 286.41 |
| 355 | 227.03 | 735 | 262.35 | 1115 | 276.94 | 1495 | 286.30 |
| 365 | 228.76 | 745 | 262.64 | 1125 | 277.33 | 1505 | 286.61 |
| 375 | 230.45 | 755 | 262.91 | 1135 | 277.55 | 1515 | 286.60 |
| 385 | 231.90 | 765 | 263.72 | 1145 | 277.38 | 1525 | 287.44 |
| 395 | 233.51 | 775 | 264.53 | 1155 | 276.78 | 1535 | 288.11 |
| 405 | 235.12 | 785 | 264.97 | 1165 | 276.44 | 1545 | 288.62 |
| 415 | 236.41 | 795 | 265.11 | 1175 | 277.15 | 1555 | 288.60 |
| 425 | 238.17 | 805 | 265.61 | 1185 | 276.99 | 1565 | 288.38 |
| 435 | 239.33 | 815 | 266.36 | 1195 | 277.27 | 1575 | 289.56 |
| 445 | 240.59 | 825 | 266.63 | 1205 | 277.82 | 1585 | 289.96 |
| 455 | 241.83 | 835 | 266.30 | 1215 | 277.88 | 1595 | 290.76 |
| 465 | 242.96 | 845 | 266.38 | 1225 | 278.07 | 1605 | 291.12 |
| 475 | 244.01 | 855 | 266.99 | 1235 | 279.43 | 1615 | 292.53 |
| 485 | 244.92 | 865 | 267.80 | 1245 | 280.22 | 1625 | 292.44 |
| 495 | 245.57 | 875 | 267.71 | 1255 | 281.43 | 1635 | 293.26 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 505 | 246.58 | 885 | 267.25 | 1265 | 282.14 | 1645 | 293.96 |
| 515 | 247.17 | 895 | 268.01 | 1275 | 282.18 | 1655 | 293.52 |
| 525 | 248.07 | 905 | 267.65 | 1285 | 283.01 | 1665 | 294.58 |
| 535 | 248.96 | 915 | 268.21 | 1295 | 283.22 | 1675 | 293.98 |
| 545 | 249.61 | 925 | 268.33 | 1305 | 283.41 | 1685 | 294.68 |
| 555 | 250.64 | 935 | 268.69 | 1315 | 283.51 | 1695 | 294.17 |
| 565 | 251.14 | 945 | 269.27 | 1325 | 283.51 | 1705 | 295.67 |
| 575 | 251.60 | 955 | 269.27 | 1335 | 283.71 | 1715 | 295.16 |
| 585 | 252.37 | 965 | 269.10 | 1345 | 284.26 | 1725 | 295.23 |
| 595 | 253.75 | 975 | 269.77 | 1355 | 284.58 | 1735 | 295.57 |
| 605 | 254.45 | 985 | 269.64 | 1365 | 284.68 | 1745 | 296.05 |
| 615 | 255.09 | 995 | 270.63 | 1375 | 284.97 | 1755 | 294.88 |
| 625 | 255.53 | 1005 | 271.13 | 1385 | 285.18 | 1765 | 295.07 |
| 635 | 255.81 | 1015 | 270.80 | 1395 | 284.86 | 1775 | 295.97 |
| 645 | 256.66 | 1025 | 271.46 | 1405 | 284.90 | 1785 | 296.85 |
| 655 | 257.39 | 1035 | 272.22 | 1415 | 284.39 | 1795 | 295.30 |
| 665 | 257.89 | 1045 | 271.70 | 1425 | 284.57 | 1805 | 295.87 |
| 675 | 258.91 | 1055 | 272.82 | 1435 | 284.78 | 1815 | 296.31 |
| 685 | 259.98 | 1065 | 273.19 | 1445 | 284.84 | 1825 | 296.24 |