

Full Papers

微量热法测定RE(Et₂dtc)₃(phen)配合物的比热容葛红光^{a,b}, 焦宝娟^l, 帅琪^l, 刘明艳³, 陈三平^l, 胡荣祖^{a,d}, 高胜利^{*,l}^l西北大学化学系, 陕西省物理无机化学重点实验室, 西安 710069²陕西理工学院化学系, 汉中 723001³绵阳中物热分析仪器有限公司, 绵阳 621900⁴西安近代化学研究所, 西安 710065

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摘要 推导了用改进的RD496-III型微热量计测定固态物质比热容的计算式. 用Joule

效应确定了仪器在298.15 K时的量热常数和精度分别为63.901±0.030

μV/mW和0.3%, 用Peltier效应测定总不平衡热.

在该仪器上测定的两种标准物质(基准苯甲酸和α-Al₂O₃)比热容的计算值与文献值相差在0.4%以内.用本法测定了13种固态配合物RE(Et₂dtc)₃(phen) (RE = La, Pr, Nd, Sm~Lu)的比热容值,与稀土原子序数Z_{RE}作图呈现三分组现象, 说明配合物中RE³⁺与配体间的化学键有一定程度的共价性, 显示了稀土离子4f电子云的扩大效应.关键词 [微量热法, 不平衡热, 固态配合物, 比热容](#)

分类号

Determination of the Specific Heat Capacity of RE(Et₂dtc)₃(phen) by MicrocalorimetryGE Hong-Guang^{1,2}, JIAO Bao-Juan^l, SHUAI Qi^l, LIU Ming-Yan³, CHEN San-Ping^l, HU Rong-Zu^{1,4}, GAO Sheng-Li^{*,l}¹ Department of Chemistry, Shanxi Key Laboratory of Physical and Inorganic Chemistry, Northwest University, Xi'an, Shaanxi 710069, China² Department of Chemistry, Shanxi University of Technology, Hanzhong, Shaanxi 723001, China³ Mianyang Chinese Physics Thermal Analysis Instrument Co. Ltd., Mianyang, Sichuan 621900, China⁴ Xi'an Modern Chemistry Research Institute, Xi'an, Shaanxi 710065, China

Abstract A calculation formula for determining the specific heat capacity of solid compound with an improved RD496-III microcalorimeter was derived. The calorimetric constant and precision determined by the Joule effect were (63.901±0.030) μV/mW and 0.3% at 298.15 K, respectively, and the total disequilibrium heat has been measured by the Peltier effect. The specific heat capacities of two standard substances (benchmark benzoic acid and α-Al₂O₃) were obtained with this microcalorimeter, and the differences between their calculated values and literature values were less than 0.4%. Similarly, the specific heat capacities of thirteen solid complexes, RE(Et₂dtc)₃(phen) (RE=La, Pr, Nd, Sm—Lu, Et₂dtc: diethyldithiocarbamate ion, phen:1,10-phenanthroline) were gained, and their total deviations were within 1.0%. These values were plotted against the atomic numbers of rare-earth, which presents tripartite effect, suggesting a certain amount of covalent character in the bond of RE³⁺ and ligands, according to Nephelauxetic effect of 4f electrons of rare earth ions.

Key words [microcalorimetry](#) [disequilibrium heat](#) [solid complex](#) [specific heat capacity](#)

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