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Tb(Sm, Dy, Tm)-BPMPHD-CTMAB共发光体系的机理探讨

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摘要 Tb^3^+(Sm^3^+, Dy^3^+, Tm^3^+)-BPMPHD-CTMAB三元离子缔合物能够发射该稀土离子的特征荧光。La^3^+, Gd^3^+, Lu^3^+, Y^3^+和某些常有猝灭作用的离子如Yb^3^+, Eu^3^+, Ho^3^+和Tm^3^+等, 对上述体系也有一定的共发光效应。本文测定了离子缔合物的组成和结构, 研究了体系的溶剂效应, 对该共发光体系的发光机理进行了探讨, 认为共发光离子配合物不仅起到能量给体的作用, 而且还具有"能量绝缘壳"的作用; 利用Forster理论估算了该体系分子间能量传递的临界距离R0(1.67nm)和能够产生共发光效应的最大距离γmax(5.48nm), 进而推测该体系分子间能量传递是以电偶极共振的方式进行的。

关键词 铽 吡唑酮 P 溶剂效应 镝 钐 铕 发光机制 己二酮 P 溴化十六烷基三甲铵

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Study on the luminescence mechanism of Tb(Sm, Dy, Tm)-BPMPHD-CTMAB Co-luminescence system

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Abstract It was found that Tb^3^+ (Sm^3^+, Dy^3^+, Tm^3^+) could form a ternary ion association compound with BPMPHD and CTMAB. The solid chelate of determined by chemical method and its composition and structure were determined by chemical method and MS, IR, NMR. The ion association system emitted the intrinsic fluorescence of Tb^3^+ (Sm^3^+, Dy^3^+, Tm^3^+) and had co-luminescence effect. Its solvent effect and luminescence mechanism was studied. Experiments showed that the exhancing ion association compound acted as not only the energy donors but also the energy-insulating sheath. The forster theory was introduced into the co-luminescence system for the first time to estimate the critical distance for 50% inter-molecular energy transfer in the Tb-Gd-BPMPHD system, R0=1.67nm, and the maximum distance, γmax=5.48nm, for the co-luminescence effect. It is believed that the inter-molecular energy transfer was carried out in a form of dipole resonance according to value of R0.

Key words THULIUM PYRAZOLONE P SOLVENT EFFECT DYSPROSIUM SAMARIUM TERBIUM LUMINOUS MECHANISM HEXANEDIONE P

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