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LUMINESCENCE AND MUTUAL ENERGY TRANSFER BETWEEN ERBIUM(III) AND MANGANESE(II) IN FLUORIDE GLASSES

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Glasses of mixed fluorides,contrary to the glasses formed by more conventional anions(such as silicate,phosphate and borate) have much greater propensity for luminescence of the excited J-levels of trivalent lanthanides.A major reason is the low vibrational frequencies(attenuating the competing non-radiative de-excitation).The composition ranges of stable glasses are quite narrow,and found pragmatically.They are wider in the presence of small amounts of $Al(PO_3)_3$ but this decreases the life-times of Er(III).The two main types used for spectroscopic studies contain GaF_3 PbF_2 and ZnF_2(which can be replaced by MnF_2);or ZrF_4 and BaF_2.Here,incorporated erbium(III) is discussed. The narrow emission bands at 550 nm($^4S_{3/2}$) and 668 nm($^4F_{9/2}$) have life-times above 0.05 ms.Energy transfer from the former level to the lowest quartet level of manganese(II),and back transfer of energy stored in Mn(II) to Er(III) providing long-lived components of the 668 nm emission,are also described.Such fluoride glasses containing Nd(III)orEr(III) may be important for lasers,fiber optics communication, and luminescent solar concentrators based on total internal reflection of emitted photons travelling to the edge of a transparent plate.

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