Modelling the luminescence due to 4f-4f transitions in rare earth based materials: recent advances

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An overview of our recent work on the nature and behavior of the intraconfigurational 4f–4f transitions in chemical environments of controllable characteristics, as well as on non-radiative energy transfer processes involving trivalent rare earth ions (both ion-to-ion and intramolecular) and their emission quantum yields, is presented. Perspectives and challenges on this fascinating subject is discussed.