Electronic Supplementary Material (ESI) for CrystEngComm.

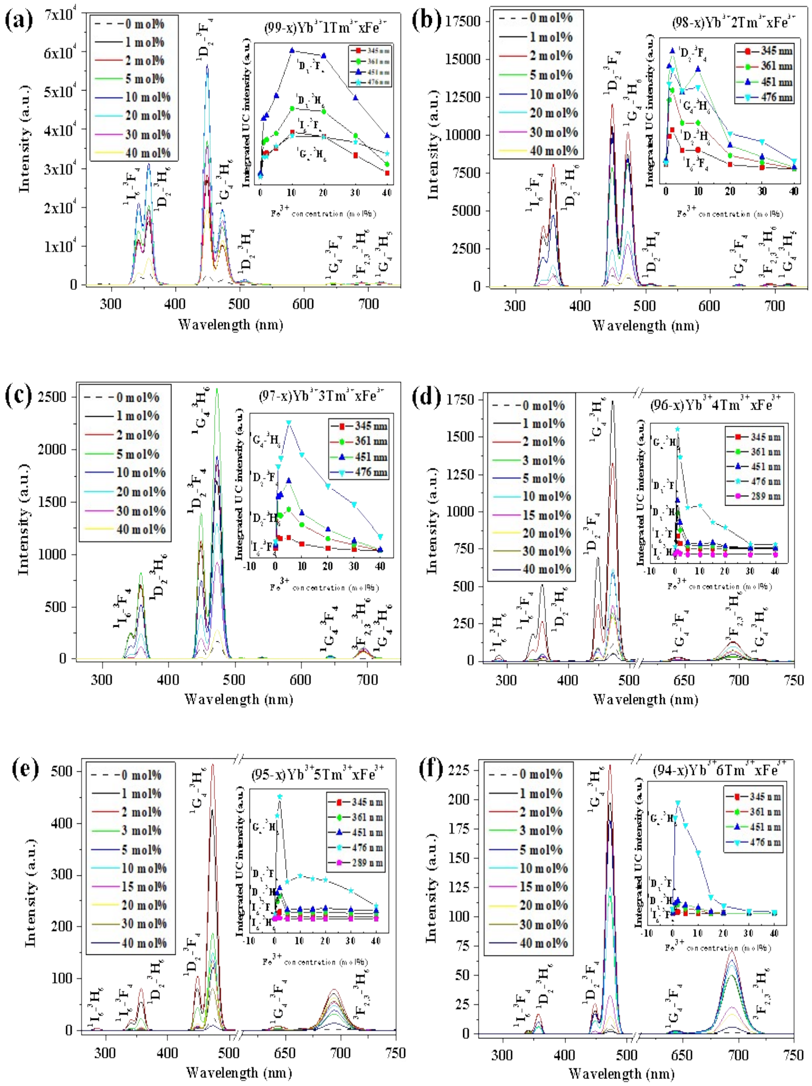

图 5-6　在功率密度为 45W/cm^2 的 980　nm 激光二极管激发下记录的 $NaYbF_4$:x　mol%Tm^{3+}/y mol%Fe^{3+}（x = 1、2、3、4、5 和 6，y = 0、1、2、3、5、10、15、20、30 和 40）的上转换发射光谱，插图是相应样品主要发射的强度与 Fe^{3+}掺杂浓度的函数关系图。光谱都是在相同的条件下记录的（发射狭缝为 2.5 nm，光电倍增管的电压为 400 V，激发功率密度设定为 45 W/cm^2）

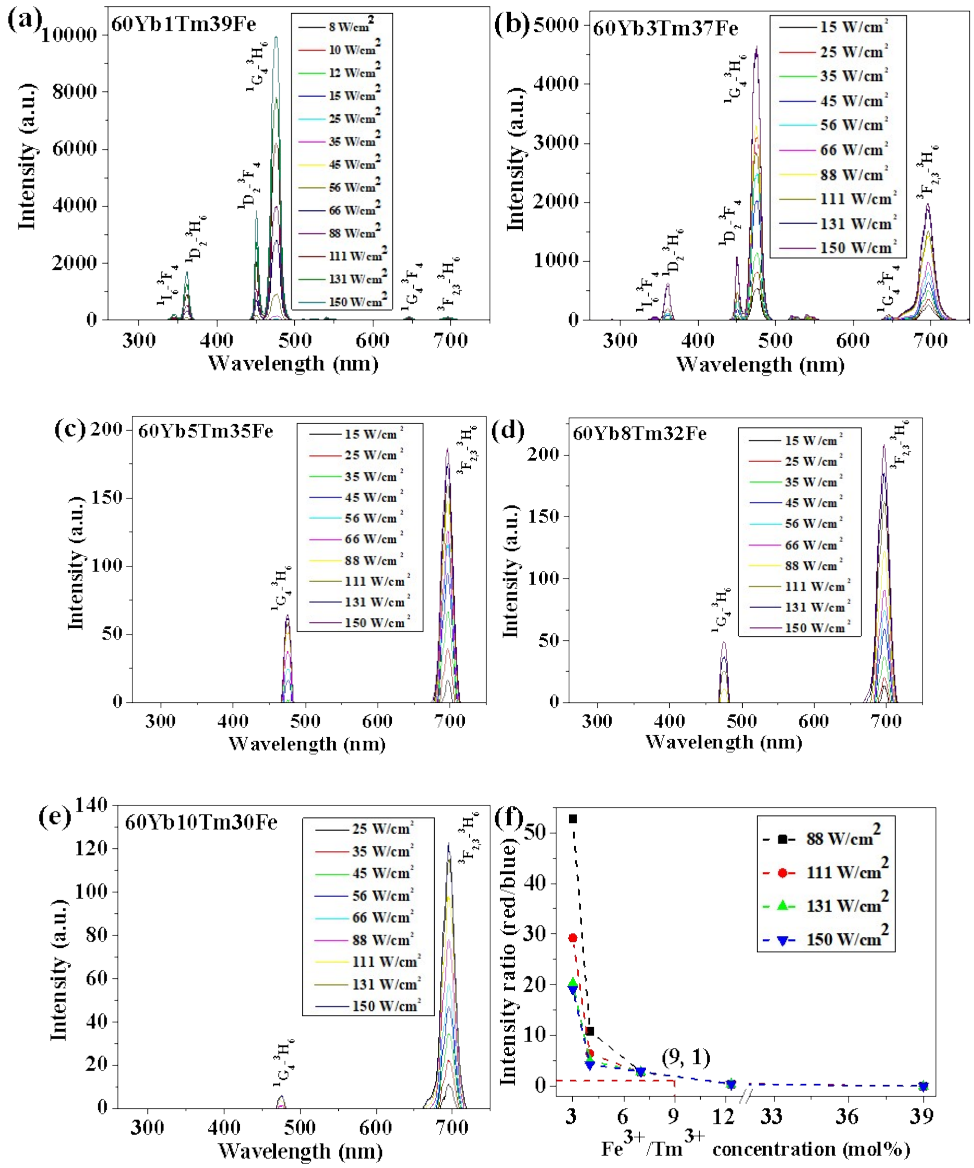

图 5-8 不同激发功率密度下高掺 Fe^{3+}（30 mol% ~ 39 mol%）的 $NaYbF_4$:Tm^{3+}纳米材料的表征：(a-e) 激发波长为 980 nm 的室温上转换发射光谱图，(f) 696 nm（$^3F_{2,3}\rightarrow{}^3H_6$）处红色发射及 476 nm（$^1G_4\rightarrow{}^3H_6$）处蓝色发射的相对强度比与样品中 Fe^{3+}/Tm^{3+}相对含量的函数关系图。

The luminescence spectra of nanoparticles were measured by the home-built luminescence spectroscopy system equipped with a pulsed magnetic field. The 975 nm laser was employed as the excitation source and coupled into a fiber to pump the nanoparticles. The nanoparticles were put at the center of the pulsed magnetic field generated by a resistive coil magnet. luminescence spectra were collected by the same fiber system with the emitted photons transmitted to the detection part and detected by a spectrometer, which is equipped with an electron multiplying charge coupled device (CCD) detector.

The magnetically induced lowering of the accepting level caused by the Zeeman splitting results in a better match with the excitation energy. Thus, the rate of excited state absorption of the activator ion is enhanced in the presence of the magnetic fifield. This mechanism has been invoked to explain the increased upconversion intensity of the red emission

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