

Ion irradiation induced damage in GGG single crystals

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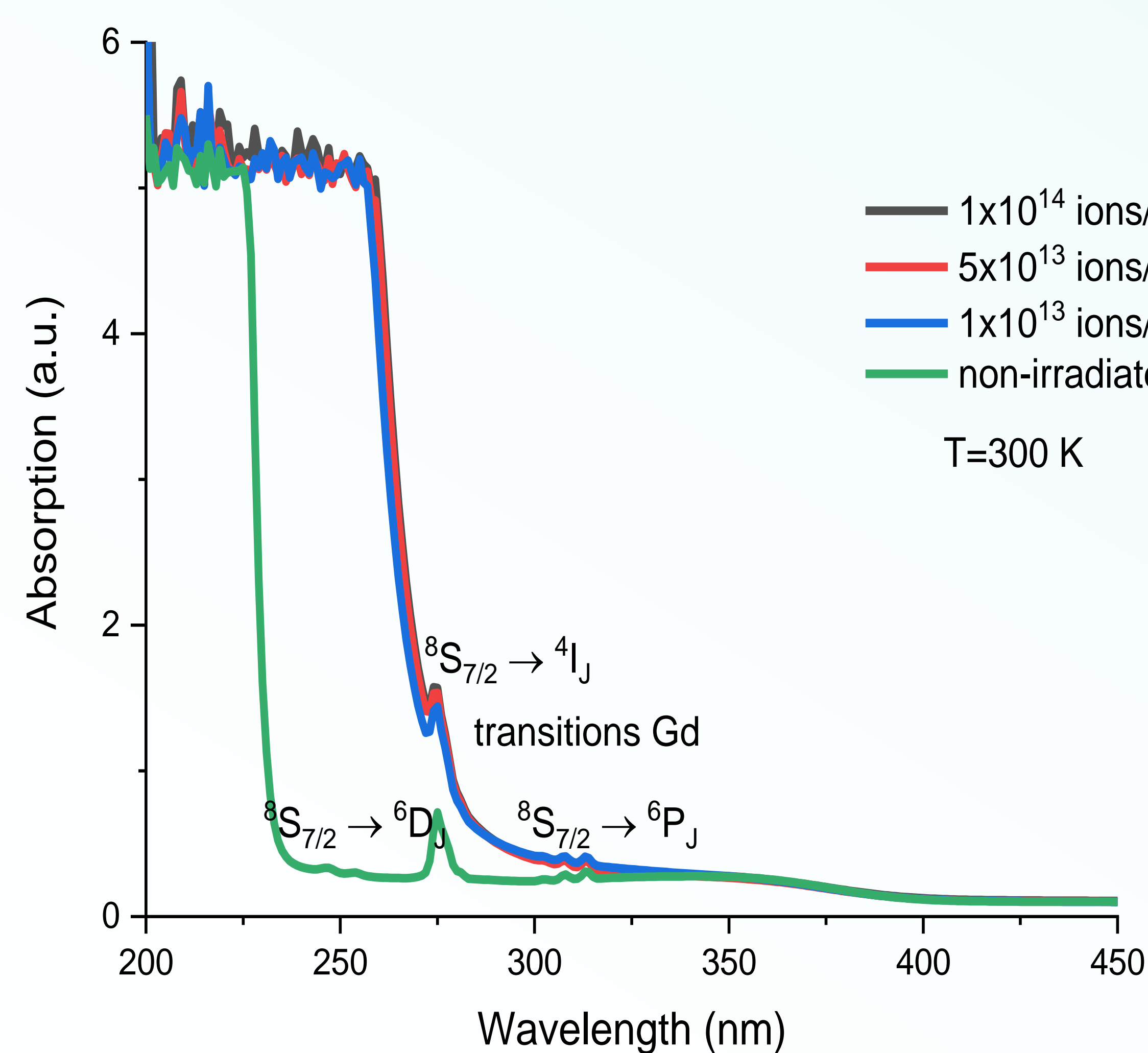
Samples

The single crystals $Gd_3Ga_5O_{12}$ or GGG are widely used and studied as solid-state laser materials, and magneto-optical storage materials, as well as, when doped with suitable ions they are used as efficient phosphors and scintillators [1-3].

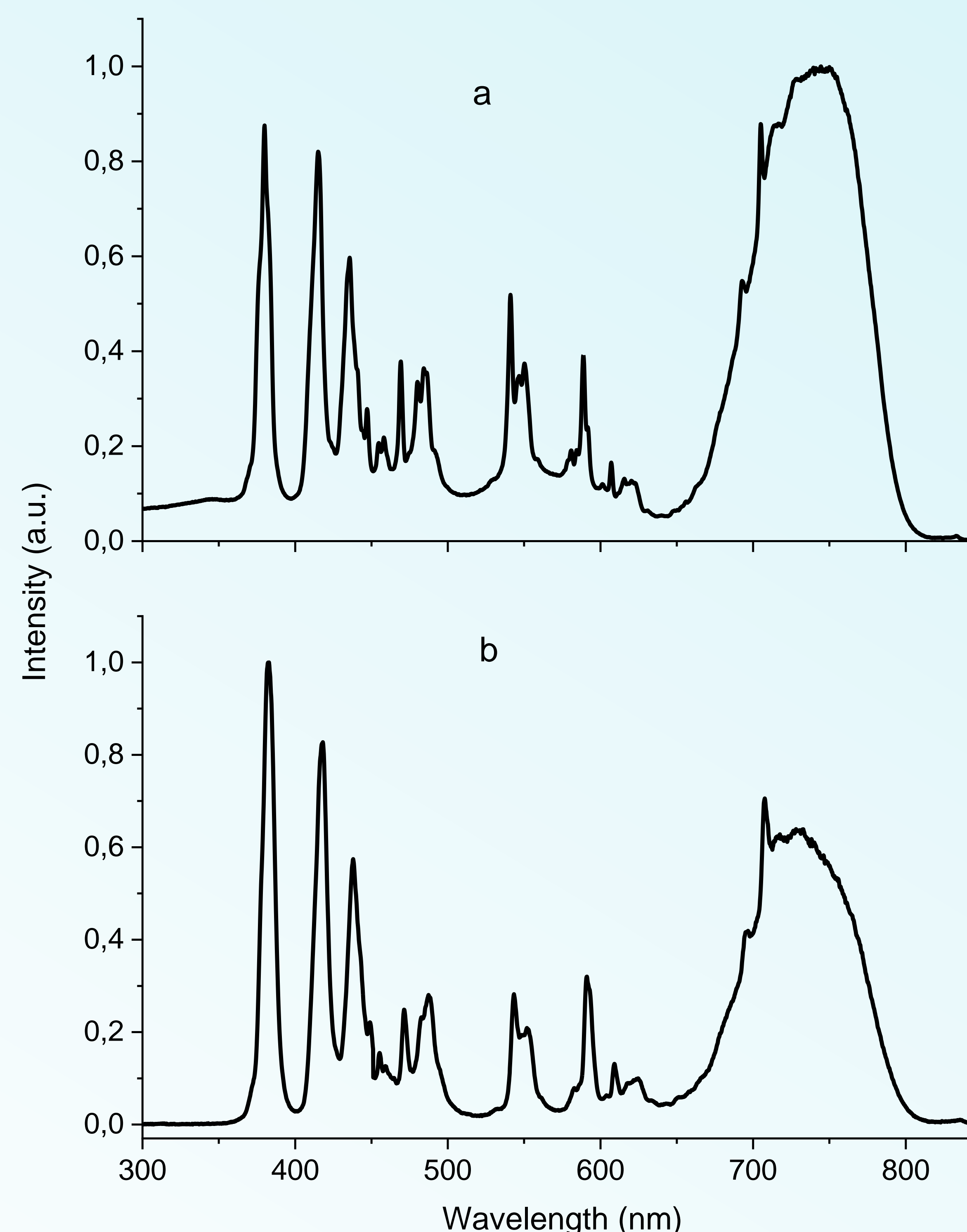
Czochralski-grown in slightly oxidizing atmosphere GGG crystals were prepared in the form of polished plates with (111) orientation and 0.48 mm thickness.

In this work, we report on the optical properties of GGG single crystals irradiated with Kr^{+15} ions with energy 1,75 MeV/u, up to fluences 1×10^{13} , 5×10^{13} , and 1×10^{14} ions/cm² at cyclotron DC-60 (Nur-Sultan).

Absorption spectra



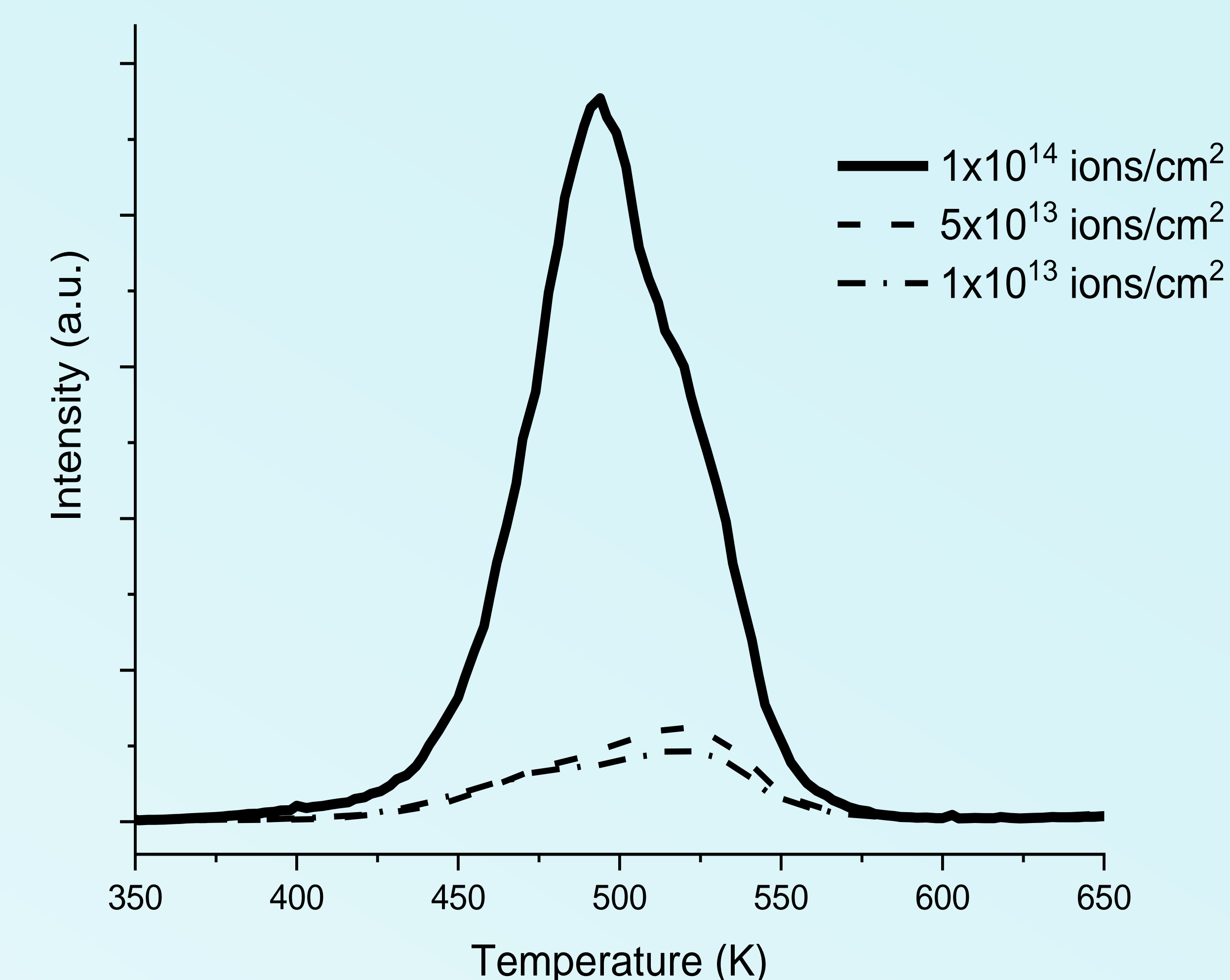
Photoluminescence spectra



PL emission spectra of the samples excited with laser beam at $\lambda_{ex}=228\text{nm}$, $T=300\text{ K}$.

a) Irradiated with fluence 1×10^{14} ions/cm²
b) Non-irradiated

Thermostimulated luminescence spectra



Conclusion

Irradiation with Kr^{+15} ions leads to a shift in the absorption edge from 220 to 270 nm, which is almost independent of the doses applied. Almost dose-independent complex TSL peak at 500 – 530 K was observed in the TSL glow curves of GGG crystals irradiated with 1×10^{13} , 5×10^{13} fluences. However, this peak sharply increases at fluence of 10^{14} ions/cm² with peak shift of up to 500K. Dose-dependent behavior of a wide emission in the region 650-800 nm in photoluminescence spectra was also observed.

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