

Journal of Applied Physics 2007 vol.101 N6

---

## Spectroscopic study of the effect of N and F codoping on the spatial distribution of Er<sup>3+</sup> dopant ions in vitreous SiO<sub>2</sub>

Gubaidullin R., Orlinskii S., Rakhmatullin R., Sen S.  
*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

---

### Abstract

Pulsed electron paramagnetic resonance (EPR) spectroscopy has been used to study the influence of codoping with N and/or F on the clustering of Er<sup>3+</sup> ions in vitreous SiO<sub>2</sub>. Measurements of echo-detected EPR, spin-lattice and phase memory relaxation times, and electron spin-echo envelope modulation (ESEEM) were made in the X band. Er-N, Er-F, and Er--F codoped glasses show clear evidence of clustering of Er<sup>3+</sup> ions at concentration levels ranging between  $6.67 \times 10^{18} \text{ cm}^{-3}$  and  $6.67 \times 10^{19} \text{ cm}^{-3}$ . However, the relatively long phase memory relaxation time and the observability of ESEEM in the Er-N-F codoped glass strongly indicate that combined codoping with N and F is more effective in homogenization of the spatial distribution of Er<sup>3+</sup> ions in vitreous SiO<sub>2</sub>, although, the structural mechanism remains unclear. The ESEEM results provide evidence in favor of the presence of N in the vicinity of the Er<sup>3+</sup> ions in Er-N-F codoped vitreous SiO<sub>2</sub>. © 2007 American Institute of Physics.

<http://dx.doi.org/10.1063/1.2713351>

---