Er^{3+}가 첨가된 metaphosphate 레이저 유리의 1. 5 μm 형광 특성

1.5 μm emission properties of Er^{3+}-doped metaphosphate laser glasses

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In recent years, there has been a great deal of interest towards Er^{3+}-doped glasses with a broad 1.5 μm emission band and are extensively investigated in searching erbium-doped fiber amplifiers (EDFAs) with a wide and flat gain spectrum that is required for dense wavelength division multiplexing (DWDM) optical network systems in telecommunication. Due to higher phonon energy, more solubility of rare earth ions and smaller upconversion coefficient of the $^4I_{13/2}$ level of Er^{3+} ions in phosphate glasses, they are regarded as better hosts for Er^{3+} ions compared to silicate glasses for high gain EDFA applications [1].

In the present work, Er^{3+}-doped metaphosphate glasses with the composition of $(59-x/2)P_2O_5-17K_2O-(15-x/2)BaO-9Al_2O_3-xEr_2O_3$ (x = 0.01, 0.1, 1.0, 2.0 and 3.0 mol%) (PKBAEr)have been prepared by melt quenching technique and studied their 1.5 μm emission properties. The base glass composition has been composed from the ranges of different components used in the Nd-phosphate laser glasses, LG-750 (Schott Glass Technologies) [2]. The glass samples were excited with 488 nm laser line of Ar^+ laser and the resulting fluorescence was dispersed by a 75 cm monochromator fitted with InGaAs detector.

Emission spectra of the $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition are shown in Fig. 1 for five Er^{3+}concentrations of PKBAEr glasses. Emission peak positions and effective linewidths (FWHM) of the spectra are collected in Table 1. Effective bandwidths are plotted in Fig. 2 versus Er^{3+}concentration. As can be seen from Table 1 and Fig. 2, the bandwidth increases almost linearly with Er^{3+}concentration up to 2.0 mol% and then gets flattens. It is worth noting that the observed values of FWHM (nm) in PKBAEr glasses are comparable or more than those reported for tellurite (60), bismuth (79), phosphate (37), germinate (42) and silicate (40) glasses [3]. Further work is in progress for fully characterizing the PKBAEr glasses for their possible applications as EDFAs, 1.5 μm IR and 545 nm green upconversion laser materials.

Table 1. Emission peak positions (λp) and effective linewidths (FWHM) of the $^4I_{13/2} \rightarrow {}^4I_{15/2}$ transition for different concentrations of Er^{3+} in PKBAEr glasses.

Conc. (mol%)	λp (nm)	FWHM (nm)
0.01	1533	60
0.1	1533	61
1.0	1538	67
2.0	1538	78
3.0	1544	81

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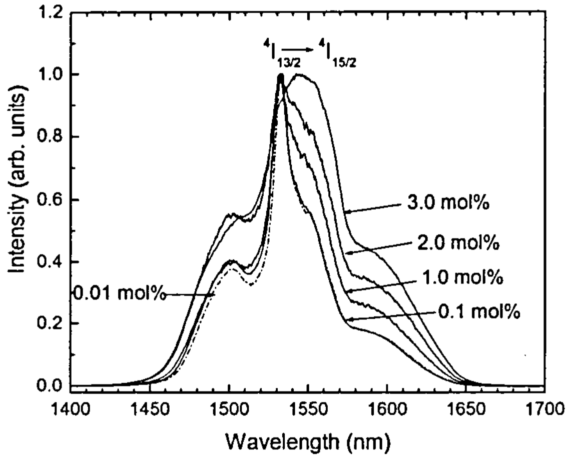

Fig. 1. $^4I_{13/2} \rightarrow {}^4I_{15/2}$ emission spectra for different concentrations of Er^{3+} in PKBAEr glasses.

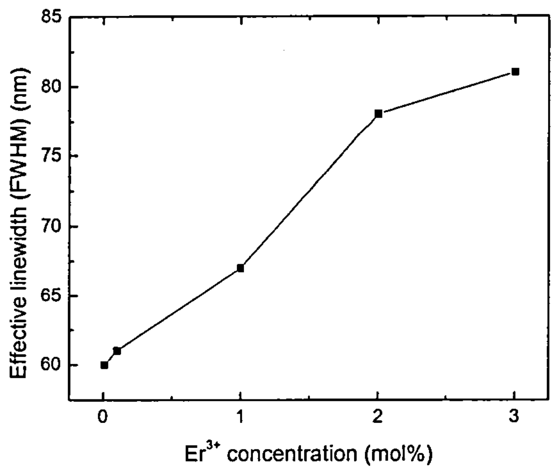

Fig. 2. Variation of effective linewidths (FWHM) with Er^{3+} concentration in PKBAEr glasses.

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