

ABNORMAL LOW LINEWIDTH TEMPERATURE  
BROADENING OBSERVED FOR YVO<sub>4</sub>:Eu  
NANOCRYSTALS

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S u m m a r y

Since the temperature broadening of spectral lines is determined by the phonon scattering by impurity centers, a modification of the phonon spectrum can affect the temperature broadening suppression. So, by controlling the nanocrystal size, the effect of “cluster freezing,” namely, the abnormal temperature broadening of weak spectral lines up to room temperature, can be achieved. The spectral lines of impurity ions in YVO<sub>4</sub>:Eu<sup>3+</sup> nanocrystals remain abnormally narrow (10 cm<sup>-1</sup>) even at room temperature, whereas, for the bulk crystals, the average linewidth at room temperature is 70 cm<sup>-1</sup>. This narrowness of spectral lines can be clearly explained by the manifestation of the phonon spectrum depletion in nanocrystals. The temperature dependences of linewidths obtained for nanocrystals with various sizes exhibit the strong dependence of the spectral line width on the sizes of a nanocrystal and differ from those for a bulk crystal.