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Multi-Wavelength Emission from Er-Implanted $YbVO_4$ Crystal

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The implantation of *Z*-cut $YbVO_4$ single crystal is carried out with a sequence of keV Er ions at room temperature, and the successful incorporation of Er^{3+} ions in $YbVO_4$ matrix is supported by photoluminescence (PL) analysis under the laser excitation at 980 nm. The detailed spectroscopic analysis on the spontaneous down-conversion (DC) and up-conversion (UC) luminescence in Er-implanted $YbVO_4$ is carried out in a wide range of excitation power. The UC luminescence is composed of blue (475 nm), green (525 and 553 nm), red (650 and 660 nm), and near-infrared (798 nm) emission bands. The spectral results reveal that the intensity of blue emission is enhanced dramatically with excitation power increase, and finally dominates the UC emissions spectrum. The quantitative studies are performed on the pumping power dependence, as well as the relative intensity ratio between representative UC emissions. The obtained results suggest that different energy transfer excitation (ET) pathways are responsible for the generations of UC luminescence signal. Herein, the possible mechanisms for the up-conversion are also proposed.

Keywords: ion implantation, photoluminescence, up-conversion, $YbVO_4$.