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Inhomogeneity of donor doping in $SrTiO_3$ substrates studied by fluorescence-lifetime imaging microscopy.

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Fluorescence-lifetime imaging microscopy (FLIM) was applied to investigate the donor distribution in SrTiO3 single crystals. On the surfaces of Nb- and La-doped SrTiO3, structures with different fluorescence intensities and lifetimes were found that could be related to different concentrations of Ti3+. Furthermore, the inhomogeneous distribution of donors caused a non-uniform conductivity of the surface, which complicates the production of potential electronic devices by the deposition of oxide thin films on top of doped single crystals. Hence, we propose FLIM as a convenient technique (length scale: 1 μm) for characterizing the quality of doped oxide surfaces, which could help to identify appropriate substrate materials.

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