Title:	Defects, conductivity and photoconductivity in Ar+ bombarded KTaO3
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Abstract:	Oxygen vacancies play a crucial role in the conductivity of oxides. Here, we report the photoresponse of the electron doped surface of Ar+ bombarded oxygen vacant (001) KTaO3 (KTO) single crystal. The bombardment time defines the amount of oxygen vacancies and hence the electron doping level. The time evolution of photoresponse to daylight illumination remains independent of the carrier density and follows the biexponential function. By contrast, the amplitude of the photoresponse increases with the decreasing charge carrier density. The samples show distinct responses in terms of amplitude as well as response time to the illumination with laser light of wavelengths 633, 532, and 405 nm. The defect states distribution within the bandgap is calculated with the photoconductivity relaxation, which involves deep sensitizing hole traps. The combined results of electrical conductivity, photoconductivity, atomic force microscopy, and Kelvin probe force microscopy suggest that the conductivity produced on the KTO surface is not continuous throughout the surface. Rather, Ar+ bombardment creates oxygen deficiency patches that are oriented along some preferential crystal orientations and interconnected with each other, thus producing percolating conducting channels on the surface of the sample. Under light illumination, photocarriers are generated in these conducting channels.
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