Abstract Submitted
for the NWS14 Meeting of
The American Physical Society

Room-temperature persistent photoconductivity in strontium titanate[1] MARIANNE TARUN, FARIDA SELIM, MATTHEW MCCLUSKEY, Washington State University, Pullman, WA — Strontium titanate ($SrTiO_3$) is an oxide material with unique properties and is often used as a substrate for oxide thin films such as high-temperature superconductors. Persistent photoconductivity (PPC) is investigated in $SrTiO_3$ single crystals at room temperature. Defects and impurities can have a strong effect on the electrical properties of $SrTiO_3$. Our prior work showed that hydrogen impurities form a defect complex in $SrTiO_3$ which we tentatively ascribed to a strontium vacancy passivated by two hydrogen atoms. The defect, alternatively, could be a partially passivated titanium vacancy. When a thermally treated sample is exposed to sub-bandgap light at room temperature, the free-electron concentration increases by over two orders of magnitude. After the light is terminated, the enhanced conductivity persists for several days, with negligible decay. We tentatively attribute the PPC to the excitation of an electron from a titanium vacancy defect into the conduction band, with a high barrier for recapture. The presence of titanium vacancies was investigated through positron lifetime measurements. Wavelength-dependence measurements showed an optical excitation threshold for photoconductivity of 2.9 eV.

[1]This work was supported by DOE and NSF.

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Date submitted: 21 Mar 2014 Electronic form version 1.4