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Self-trapped holes in SiO2 glasses

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Abstract: **Anderson localized states near the valence band in SiO2 glasses play an important role in determining bandgap of the glasses, therefore understanding the formation of these localized states and tuning their energy levels are essential to develop ultra-transparent glasses in deep ultraviolet region. Here we employed electron spin resonance (ESR) method to probe a kind of electrically actively defects—self-trapped holes (STH) that are created by low temperature UV-laser irradiation. The decay of the ESR signals was found to be bleaching photon energy dependent, and follow the stretched exponential decay function at each bleaching wavelength. When one-photon process is dominant during the photo-bleaching process where the recombination of electrons excited from the valence band with the holes in the STHs band results in the decay of STHs signals, the energy levels of STH1 were thus derived at 1.75±0.02 eV, and STH2 at 1.68±0.02 eV, respectively, for the glasses with a fictive temperature of Tf=1500°C. Further investigations indicated that the energy levels of STH1 and 2 downshift and broaden in the glasses with lower fictive temperatures, and fluorite doping could suppress the formation of STHs.**

王荣平博士现任澳大利亚激光物理中心研究员， 他领导的实验室在玻璃材料研究方面是国际领先的实验室。他 2000 年在中科院物理所取得博士学位后，先后在以色列理工学院，日本产业技术研究院，丰田中央研究院工作，在 SCI 检索的刊物上发表论文 100 余篇，包括国际顶尖的专业材料物理刊物等。近五年来，在国际学术会议上作过 10 多次邀请有关硫系玻璃的邀请报告，包括美国 MRS 和陶瓷学会的年会，担任过澳大利亚陶瓷学会年会，国际材料联合会的组委会成员并主持相关的分会。美国 Lehigh University 客座研究员。