The Photoconductivity of SrS:Eu^{2+}

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We have investigated the photoconductive response of SrS:Eu^{2+} to locate the position of the Eu^{2+} energy levels with respect to the host valence and conduction bands.

The photoconductivity of insulators is, by definition, a weak effect. In the case of SrS the experiments become even more difficult due to the lack of single crystals. Thus we have to work with micro-crystalline powders, which often show several orders of magnitude smaller photoconductive signals, as compared to single crystals.

For photoconductivity measurements on micro-crystalline samples we have designed a sample mount that acts as a pressure cell using two fused silica windows (diameter:12.7 mm, thickness: 4 mm) as anvils. One of the windows supports a set of evaporated nickel electrodes with a 1 mm wide gap. The window is placed into the copper sample holder and the SrS powder is loaded on top of the fused silica disk. A second fused silica disk is used to press the powder onto the electrode. The sample cell is then mounted onto the cold finger of a temperature variable cryostat (T=70 K to T= 300 K) and connected via vacuum feedthroughs to the high voltage supply and electrometer. Photocurrents are excited by illuminating the gap between the electrodes. As a tunable light source we use a 300 W Xe high pressure lamp filtered by a McPherson f/2 double monochromator. The photocurrents are measured with a Keithley 6517A electrometer, which also supplies the potential between the electrodes. Fields of up to 10,000 V/cm were applied, our detection threshold is in the range of 5×10^{-16} A. This sensitivity can be reached only by electrostatic shielding and the overall mechanical stability of the setup.

We complement our photoconductive studies with standard optical techniques like emission and photoexcitation measurements and compare our results to those obtained for CaS:Eu^{3+}.

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