Low Temperature Cathodoluminescence of Space Observatory Materials

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Low Temperature Cathodoluminescence of Space Observatory Materials

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The images to the left show SLR CCD camera images of SiO2 cathodoluminescence. These images show the temperature dependency of SiO2 cathodoluminescence. At low temperature, the glow appears red and blue. As the sample temperature increases from 163 K to 273 K, the red light becomes much more intense, and the glow appears to be dominantly blue.

Model

A model with multiple bands of disordered states in the band gap has been developed to qualitatively explain the temperature dependence of the observed luminescence spectra. We begin with a simple two band model. In this model, the red band represents the red photon emitting band. The blue band represents the UV photon emitting band.

Temperature Dependence Results

The red-blue component intensities of the SLR images are plotted as a function of temperature. Here we see graphically what we infer by looking at the images: that is, as temperature increases, blue intensity also increases and red decreases. We also see that the glow is dominated by a similar manner as the red, though we could not observe this by simply looking at the images.

Future Work and Acknowledgements

Right now, our model is only a qualitative one used to illustrate the behavior of our SiO2 thin films. In the very near future, this model will be a quantitative one. Its validity will also be put to the test as experiments are extended to lower temperatures, down to 4K.

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