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Energy Transfer Processes in Pr-doped Y_2SiO_5 JOHN COLLINS, JESSICA TOLSON, Wheaton College, B. DI BARTOLO, Boston College — Insulating materials containing trivalent Pr are candidates for lasers in the blue and red spectral regions, as well as efficient phosphors. The viability of Pr -based compounds in these applications depends on the efficiency of luminescence from various energy levels of the Pr ion. This work reports on the concentration and temperature effects of the luminescence from Pr^{3+} in yttrium silicate (Y_2SiO_5) in samples with Pr concentrations of 0.05% and 1.0% in two sites. Our work shows that the decay rate of the $^1D_2$ level of Pr^{3+} at both sites decreases considerably as the concentration of Pr increases. The (primarily red) luminescence from the $^1D_2$ level is strongly quenched, with the decay rate changing by more than an order of magnitude from the .05% sample to the 1.0% sample. The decay curve of the $^1D_2$ level is non-exponential, showing an initial fast decay and a long tail whose lifetime approaches that of the $^1D_2$ level in the 0.05% sample. The $^1D_2$ decay time also decreases as the temperature increases. The mechanism responsible for the quenching of the $^1D_2$ emission is cross relaxation, aided by diffusion at low temperature and the presence of phonons at high temperature.

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