Abstract Submitted
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Temperature-dependence of global radiation damage to protein crystals[1] MATTHEW WARKENTIN, ROBERT THORNE, Cornell University, Physics Department — We have measured the global radiation sensitivity of model protein crystals as a function of temperature in the range 300 K to 100 K. Our data show three regimes, each characterized by a different activation energy for damage. Between 300 and 225 K, the activation energy is considerably less than would be expected if it was limited by the diffusion of radicals or (diffusive) conformational changes in the molecular structure. This suggests that some other mechanism is the bottleneck for radiation damage in this temperature range. From 225 to 160 K, the activation energy is consistent with radiation damage being diffusion limited. Below 160 K, the activation energy is very small, and is consistent with activation energies for damage of small biomolecules. These results shed light on the underlying mechanisms of radiation damage in protein crystallography, and also inform temperature-dependent studies of protein crystals about radiation damage at temperatures other than 100 K.

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