

An environmental control box for serial crystallography enables multi-dimensional experiments

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Abstract

We present a new environmental enclosure for fixed-target, serial crystallography enabling full control of both the temperature and humidity. While maintaining the relative humidity to within a percent, this enclosure provides access to X-ray diffraction experiments in a wide temperature range from below 10 °C to above 80 °C. Coupled with the LAMA method, time-resolved serial crystallography experiments can now be carried out at truly physiological temperatures, providing fundamentally new insight into protein function. Using the hyperthermophile enzyme xylose isomerase, we demonstrate changes in the electron density as a function of increasing temperature and time. This method provides the necessary tools to successfully carry out multi-dimensional serial crystallography.

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