Supplementary Material.

Following the assumptions and derivation in Warkentin et al., 2012a, the steady-state temperature profile within a cylindrical crystal of radius r_2 illuminated by a uniform circular X-ray beam or radius $r_1<r_2$ is

$$T(r) = -\frac{r^2 D}{2k} + \frac{Dr_1^2}{2k}\log\left(\frac{r_2}{r_1}\right) + \frac{Dr_1^2}{2}\left(\frac{1}{r_2 h} - \frac{1}{2k}\right) + T_{ambient}, \quad 0 < r < r_1,$$

$$T(r) = \frac{Dr_1^2}{2k}\log\left(\frac{r_2}{r}\right) + \frac{Dr_1^2}{2r_2 h} + T_{ambient}, \quad r_1 < r < r_2,$$

where D is the absorbed X-ray power per unit volume in units of W/m^3 (proportional to the dose rate), k is the thermal conductivity of the cylinder, and h is the heat transfer coefficient for the boundary layer adjacent to the crystal's surface.