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# Performance analysis of a novel monochromator design for the APS SRI-CAT beamline 2-ID-E

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Third-generation synchrotron x-ray facilities, such as the Advanced Photon Source, generate a very high heat flux in a very small area. In order to preserve the brilliance of source, many optical components have to be designed to undergo very small thermal deformation (or the change of slope of a flat surface). When an optical component is subjected to a heat load, there will be thermal deformation caused by a temperature increase from the initial state. For a plate-like structure, the temperature difference over the thickness causes bending and the average temperature increment causes axial deformation. For an optical element, the slope change due to bending is the main reason for the degradation of the performance of the optical component. The change of slope should be limited to a few micro-radians. There are many ways to control the thermal deformation, such as cryogenical cooling, inclined geo-metry, liquid-metal cooling, pin-post or microchannels, using a high-heat-conductivity material such as diamond, etc.

In an accompanying conference paper, an adaptable design technique has been proposed to make use of a novel self-adapted smart structure. Its performance is independent of the heat-load intensity. When a device is exposed to a heat load, the flat surface remains flat in the area of interest. Therefore this technique can potentially be used to achieve a high precision optical component. Application of the proposed design technique to the monochromator for the SRI-CAT Sector 2 insertion device beamline (Sector 2-ID-E) is explained, and initial analytical results are presented on its performance.

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