Nanopositioning Flexure Stages Development for Synchrotron Radiation Instrumentation at the Advanced Photon Source

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Nanopositioning techniques present an important capability to support the state-of-the-art synchrotron radiation instrumentation research for the Advanced Photon Source (APS) operations and upgrade project. To overcome the performance limitations of precision ball-bearing-based or roller-bearing-based stage systems, compact nanopositioning flexure stages have been designed and developed at the APS for x-ray beamline instrumentation applications. Recent progress of such stages development is discussed in this paper, which includes: rotary flexure stages with degrees travel range and 10-nrad-level resolution for x-ray monochromators and analysers, tip-tilting flexure stages for K-B mirror based nanofocusing hard x-ray optics, and linear vertical and horizontal nanopositioning flexure stages with centimeter-level travel range and microradian-level motion trajectory reproducibility for x-ray optics and sample manipulation. The mechanical design and preliminary test results are described in this paper.

Keywords: nanopositioning, x-ray optics, precision motion control

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