

## **FOCUSED BEAM TOTAL REFLECTION X-RAY FLUORESCENCE ANALYSIS USING DOUBLY CURVED CRYSTAL OPTICS**

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Doubly curved crystal optics can provide large collection solid angle from a small x-ray source. In the past these were difficult to fabricate. The recent innovative doubly curved crystal optic technology provides accurate bending figures of thin crystals and produces high performance doubly curved crystal optics. The high quality doubly curved crystal can increase the intensity of the primary beam significantly for total reflection x-ray fluorescence (TXRF) application based on a low power x-ray source. More importantly, the doubly curved crystal provides point focusing beam and local analysis can be achieved. In this report, toroidal Si crystals are used to focus Cu  $K\alpha$  and Mo  $K\alpha$  x-rays from low power compact x-ray tubes that have maximum power setting at 50kV and 1mA. With a slit aperture to control the convergent angle, a fan Cu  $K\alpha_1$  beam with  $7^\circ \times 0.2^\circ$  convergent angle is obtained for TXRF excitation. Similarly, a fan Mo  $K\alpha_1$  beam with  $6^\circ \times 0.1^\circ$  convergent angle is used for high-energy excitation. The minimum detection limits of Br and Mn on the Si wafer surface were estimated to be 50fg and 60fg, respectively, with 500s measurement time for this TXRF system.