Poster Presentation

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MetalJet source for time resolved diffraction in the home laboratory

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High-end x-ray diffraction techniques such as small molecule crystallography,macromolecular crystallography and non-ambient crystallography rely heavily on the x-ray source brightness for resolution and exposure time. As boundaries of technology are pushed forward samples are becoming smaller, weaker diffracting and less stable which put additional requirements on ever brighter sources. With bright enough compact sources, time resolved studies can be achieved even in the home laboratory. Traditional solid or rotating anode x-ray tubes are typically limited in brightness by when the e-beam power density melts the anode. The liquid-metal-jet technology (MetalJet) has overcome this limitation by using an anode that is already in the molten state thus e-beam power loading above several megawatts per mm are now feasible.

Over a decade ago the first prototypes of liquid-metal-jet x-ray sources were demonstrated. These immediately demonstrated unprecedented brightness in the range of one order of magnitude above current state-of-the art sources [1,2]. Over the last years, the liquid-metal-jet technology has developed from prototypes into fully operational and stable X-ray tubes running in more than 50 labs over the world. X-ray crystallography has been identified as a key application for the x-ray tube technology, since this application benefits greatly from small spot-sizes, high-brightness in combination with a need for stable output. To achieve a single-crystal-diffraction (SCD) platform addressing the needs of the most demanding crystallographers, multiple users and system manufacturers has since installed the MetalJet x-ray source into their SCD set-ups with successful results [4].

This contribution reviews the evolvement of the MetalJet technology specifically in terms of stability, lifetime, flux and brightness and its applicability for pushing boundaries of high end SCD supported by recent user data. We also present recent possibilities to achieve cost effective solutions attainable for a wider application range. Finally, we discuss details of the technology with a focus on the fundamental limitations and its possibilities towards home lab based time resolved SCD.

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