# Imaging Fast Processes in Liquid Metal Foams and Semi-Solid Alloys Using Synchrotron Radioscopy with Spatio-Temporal Micro-Resolution

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**Abstract** New X-ray sources of unmatched brilliance, like the superconducting undulator device at ESRF high-energy beamline ID15A, allow for micro-radioscopic investigations with time-resolution up to the micro-second range. Here we present first results of two recent in situ experiments: the visualization of semi-solid metal flow at an acquisition speed 500 frames/s (fps) and the collapse of pore walls in liquid metallic foams investigated at 40,000 fps. Both applications reveal important qualitative and quantitative facts about the dynamic processes in liquid and/or semi-solid metals which were inaccessible until now because of either the limited spatial and/or the limited time-resolution of conventional X-ray devices. Thus, semi-solid slurry is observed to break into small particle clusters when injected at high speed. The event of cell wall collapse in metal foams is found to take $\sim$1–2 ms time, indicating that the dynamics of this system is inertia controlled.

## 1 Introduction

The outstanding scientific value of time resolved imaging is known since the famous high-speed movies of living insects by Bull (1928). Yet, time-resolved

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