Contribution ID: **270** Type: **not specified**

Benefits of synchrotron imaging techniques for material characterization and product testing

Wednesday, 20 November 2024 12:00 (15 minutes)

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1. Introduction

Novitom is an independent company, specialized in 3D material characterization, NDT and analysis based on advanced imaging techniques including synchrotron technology. As a pioneering service provider, Novitom uses cutting-edge, non-destructive 3D tools, such as 3D micro-imaging and micro-analysis based on state-of-the-art synchrotron technologies, and develops specific measurements and protocols to meet the needs of its customers in terms of material characterization and product/process control.

1. Case studies

As service provider specialized in 3D micro-imaging, Novitom was involved, ensuring a flexible-service from one-time to multi-year partnership, in projects that always ensure high value business outcomes. Furthermore, end-to-end innovative solution development for 2D/3D image analysis/treatment, optimization of X ray CT acquisition, in situ testing are topics in which Novitom has been involved in these years.

The services that can be achieved through state-of-the-art synchrotron technologies may be: the use of enhanced phase contrast, local high resolution tomography scans on large samples, the possibility to add instrumentation around the sample, the visualization of highly and poorly absorbent materials, extremely fast acquisitions enabling systematic analyses to control the repeatability or the variability, the use of AI based imaging artefacts correction and the following image analysis.
All these possible improvements with respect to standard techniques allow infinite possibilities which could be exploited by industry. Materials, parts and even biological tissues may be characterized in detail through failure analysis of parts in-service, mimic processes leading to their optimization, describe mechanical behavior of materials.
In these contexts synchrotron tomographic imaging may be used to provide crucial information non-destructively, such as:
• detect the presence on surface or embedded of cracks, their geometrical characteristics, 3D distribution, density, connectivity and their propagation under external stress;
• geometry of the filter particles, statistics on the number of clogged channel, channel fill rate, geometry of an unclogged channel and its walls, validate simulations, describe the mechanisms and nature of clogging;
• volume fraction, orientation, size distribution, distance to closest neighbour of fibres, charges and porosities.

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Presenter: CIUFFINI, Andrea Francesco (Novitom)

Session Classification: Plenary

Track Classification: AfLS