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## CARNAÚBA: a Multi-analytical X-ray Nanoprobe Beamline of Sirius with Applications in Agro-environmental Sciences

*Wednesday, July 12, 2023 4:00 PM (15 minutes)*

CARNAÚBA is an acronym for Coherent X-ray Nanoprobe Beamline, which is a nanofocused, multi-analytical and coherent X-ray imaging beamline of Sirius, the 4th generation synchrotron source of the Brazilian Synchrotron Light Laboratory. Its design is all-achromatic mirror-based optics, with a 4-bounce Si(111) crystal monochromator (4CM) that provides resolving power of  $\Delta E/E = 10^{-4}$  in monochromatic mode, and KB (Kirkpatrick-Baez) mirrors, which allows beam nano-focusing in two experimental stations: TARUMÁ (Tender-to-hard X-ray for sub-micro analysis), which works with submicrometric beam and variable sample environment; and, SAPOTI (Scanning Analysis by Ptycho for Tomographic Imaging), with nanometric beam (30 nm x 30 nm) working in cryogenic and ultra-high vacuum environment. CARNAÚBA covers the energy range from 2.05 to 15 keV and works in both pink (high flux) and monochromatic beams (high energy resolution) modes, with capabilities for 2D and 3D experiments based on X-ray absorption and X-ray scattering that includes: X-ray diffraction (XRD), X-ray absorption (XAS), X-ray fluorescence (XRF), X-ray excited optical luminescence (XEOL), Bragg and ptychographic coherent diffraction imaging (Bragg-CDI and ptycho-CDI). The TARUMÁ endstation is the first in operation, with innovative instrumentation solutions for experiments in-situ, in-operando, in-vivo, and cryogenic, covering a large scientific program that ranges from agriculture, soils and plant science, cultural heritage, biology, geophysics, catalysis, to energy materials, and other areas. In this talk, a general overview of the Carnauba beamline along with a description of several dedicated arrangements for the TARUMÁ endstation will be presented. This presentation will also show a number of examples of 2D and imaging capabilities of the CARNAÚBA beamline for samples of relevance for agricultural sciences (minerals, plants, roots, etc.).

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