CeMOX, a Collaborative facility for Development of High Performance Multilayer Optics

Blandine Capitanio[a], *David Dennetiere*[a], *Evgueni Meltchakov*[b], *Catherine Burcklen*[b], *Maël Dehlinger*[b], *Danielle Dowek*[c], *François Polack*[a], *Franck Delmotte*[b]

[a]*Synchrotron Soleil, L'orme des merisiers, Saint-Aubin, 91192 Gif-sur-Yvette, France.*
[b]*Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Saclay, 91127 Palaiseau cedex, France.*

[c]*Institut des Sciences Moléculaires d'Orsay, Fédération Lumière Matière, Bat 350, Université Paris-Sud,91405 Orsay, France*

Author Email: blandine.capitanio@synchrotron-soleil.fr

An X-ray optics community is organizing among Paris-Saclay University around the synchrotron and XUV ultrafast sources, in order to extend the user access to short wavelength experiments. This community is raising new demands of multilayer optics, with a particular stress to achieving small periods and precisely controlling period gradients.
In this context the CeMOX ("Couches Minces pour l'Optique X") managing collaboration has been renewed around Laboratoire Charles Fabry (CNRS UMR8501), SOLEIL Synchrotron and others laboratories form Université Paris-Saclay which are part of the Fédération Lumière Matière (CNRS FR2764). The CeMOX facility including multilayer magnetron sputtering and Cu Kα grazing incidence x-ray reflectometry located at Institut d'Optique was moved in new and larger clean room.
Present work is mostly focused on three subjects.

- High efficiency gratings for synchrotron X-ray monochromators in the 1 – 4 keV energy range.[1]
- Normal incidence multilayer coating for soft-X microscopy in the water window,[2]
- Mirrors for the ultra-fast X-UV sources within Paris-Saclay campus such as ATTOLAB [3], where a precise selection of the bandpass is required while maintaining a minimum pulse length.[4]

CeMOX has been mostly relying on its Plassys MP800 magnetron deposition machine which can host mirrors up to 260 mm long. It will soon receive a new MP1000 machine which will be able to host optics up to 350 x 100 x 100 mm^3, and will be equipped with an auxiliary ion gun. This new equipment will help to achieve precise layer thicknesses and accurate period gradients, even on the large optics needed by synchrotron applications.
For the water-window microscopy project, the period gradient has to be exactly matched to the strong curvature of Schwarzschild mirrors. A new reflectometer under construction will allow to characterize these new optics on SOLEIL synchrotron beamlines.
Examples of main achievements and new developments within CeMOX facility will be presented and discussed.

[1] F. Choueikani et al., Optics Letters 39, 2141 (2014)
[2] C. Burcklen et al., Journal of Applied Physics 119, 125307 (2016)
[3] http://attolab.fr
[4] F. Delmotte et al., Proc. SPIE 9589, 958907 (2015)