

# Electronic structure studies of graphene and graphene based functional materials by soft X-ray absorption spectroscopy and spectromicroscopy at Canadian Light Source

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Abstract :

Deeper understanding of the electronic structure of graphene and the interfaces within graphene-based hybrid materials are crucial for a further enhancement of their applications in fuel cell<sup>1</sup> and artificial and batteries<sup>2,3</sup>. X-ray absorption near-edge structures (XANES) spectroscopy can reveal detailed information on the electronic structure and the local chemistry of the absorbing atom. With soft X-ray, XANES can gain information on the surface with electron yield (probing depth of 5-10 nm) and subsurface with fluorescence yield (probing depth of 100 nm) simultaneously which are perfect to study the surface and interface of materials even under operando. Further, scanning transmission X-ray microscopy (STXM), and Photoemission electron microscopy (PEEM), based on the X-ray absorption process, has a chemical contrast mechanism to allow for imaging at the nano-scale which can nicely correlate performance with structure variation in novel materials<sup>4,5,6</sup>. In this talk I will introduce how to apply soft X-ray XANES and STXM/PEEM at CLS to gain a deeper understanding of electronic structures in graphene and graphene-based hybrid materials. The emphasizes is XANES at C and O K-edge and transition metal L-edge, which can identify the strong chemical bonding nature in graphene supported novel inorganic hybrid nanostructures, the key in making super active non-precious metal fuel cell catalyst<sup>1</sup> and battery electrode materials with greatly improved performance<sup>2-6</sup>.

## REFERENCES

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