Recent instrumental and methodological developments in TEM

Etienne SNOECK

CEMES-CNRS 29 rue J. Marvig 31055 Toulouse

The last 10 years have seen a drastic improvement of (S)TEM both in term of the optics of the columns themselves (new high brightness guns, Cs and Cc correctors, monochromators) allowing (S)TEM reaching much higher spatial resolution (up to 50 pm) and better energy resolution (down to 10 meV) with a much more coherent electron beam. In addition, progresses in associated equipment like new fast detectors of higher sensitivity, new advanced dedicated stages for in-situ experiments, EELS spectrometers and X-ray detectors of higher energy resolution and better sensitivity allow getting quantitative information with much higher sensitivity on materials studied under different environments (gas, liquid) and various external stimuli (T°, stress, electric and magnetic fields). Last but not least, thanks to the use of controlled pulsed electron source, time resolved experiments up the femtosecond regime can now be performed driving TEM to an area of material science that was not possible to tackle until now.
I will try to make an overview of these very last instrumental progresses and show how they push TEM to make drastic advances in material science and biology.