

# Developments of high brightness cold field emission source fo TEM and SEM applications

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Cold field emission gun are the brightest electron sources available for transmission and scanning electron microscopes. Due to this very important property in electron microscopy, this technology, which remains almost unchanged since 40 years, could be a suitable choice when using methods which requires a high spatial or temporal coherence of the electron beam, like for EELS, STEM or electron interferometry.

However, some several drawbacks are inherent to CFEG like the stability of the emitted current which, in the most favorable case, decreases by some 10%/hours, the beam noise (standard deviation around 1%), ... To tackle these problems, the use of ultra high vacuum, careful high voltage conditioning and flash cleaning of the tip are mandatory. By using a new carbon cone nanotip (CCnT), we have succeeded to improve considerably the stability of the electron beam with almost no decay during 8 hours, and a standard deviation of the noise lower than 0.5%, which avoids the use of intensive flash cleaning technology. An increase by a factor of 3 to 5 has been also observed in the reduced brightness. Results have been obtained both with high voltage TEM and Butler type low voltage SEM gun.