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Enhanced electron field emission from simultaneously purified and nitrogen incorporated CNTs via tip opening by Novel *in-situ* nitrogen ECR plasma[1] SWATHI IYER, PAUL MAGUIRE, NIBEC, University of Ulster — We report a novel single step process by means of *in-situ* nitrogen ECR plasma treatment with very low power and treatment time for the simultaneous metal catalyst (iron) removal via tip opening and nitrogen functionalization/incorporation of the vertically aligned multiwalled carbon nanotubes synthesised using a microwave plasma enhanced chemical vapour deposition. Microscopic (SEM) and spectroscopic (NEXAFS, XPS and Raman) studies reveal negligible remaining Fe content (0%) and limited/no damage structure and alignment of the nanotubes. The incorporation of nitrogen was elucidated by the N-k edge NEXAFS spectra, where the sharp π^* peak splits into three distinct peaks at energies 399, 399.5 and 401.1 eV. Increase in the at. % conc. of N 1s from 0.7 to 6.9 % and the disappearance of the peak at 780 eV by XPS and Raman corroborate the inclusion of nitrogen in the CNTs and the complete removal of iron metal catalyst. Metal catalyst removal and nitrogen addition by N-ECR plasma leads to enhanced field emission with very low turn on and threshold fields of 0.52 V/μm and 0.76 V/μm as compared to the recent studies of other nitrogen doped nanomaterials by plasma treatments.

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