Constitution and microstructure of Li-Ni-Mn-Co-O thin film cathodes

1.5 µm thick Li-Ni-Mn-Co-O cathodes have been deposited by r.f. magnetron sputtering from Li$_{1.25}$(Ni$_{0.42}$Mn$_{0.21}$Co$_{0.37}$)O$_2$ target. The elemental composition varies with argon working gas pressure (0.2 Pa to 20 Pa) and was determined by inductively coupled plasma-optical emission spectroscopy (ICP-OES) in combination with carrier gas hot extraction. The microstructure of the films was characterized by X-ray diffraction (XRD) and by micro-Raman spectroscopy at room temperature. The as-deposited films are nanocrystalline and show their highest grade of crystallinity in the range between 0.2 Pa to 0.5 Pa and at 7 Pa. Correlations between process parameter, constitution and microstructure are discussed in detail.