

Fig. Supp.1 : Typical example of a high detail XRD analysis and Rietveld refinement of the as grown radial filled CNTs structures. Before measurement the sample was transferred in a quartz substrate and pressed with a quartz slide. The following relative abundances were extracted from the Rietveld refinement: 90% Fe₃C (COD 1008725, space group Pnma), 7% γ-Fe (COD 9008469, space group Fm-3m) and 3% FeS₂ (COD 1534893, space group Pca21)

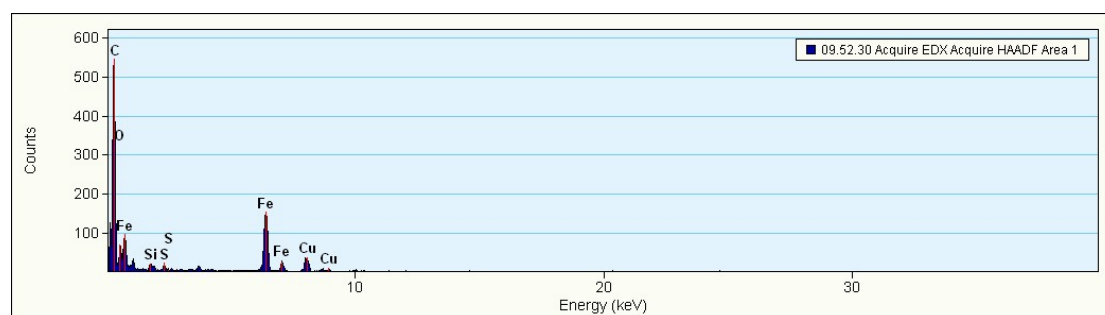


Fig. Supp.2 : EDX analyses of the as grown radial filled CNTs structures showing the following weight abundances: 79.1% of C, 2 % of Oxygen, 0.3% of Si, 0.6 % of S, 18% of Fe.

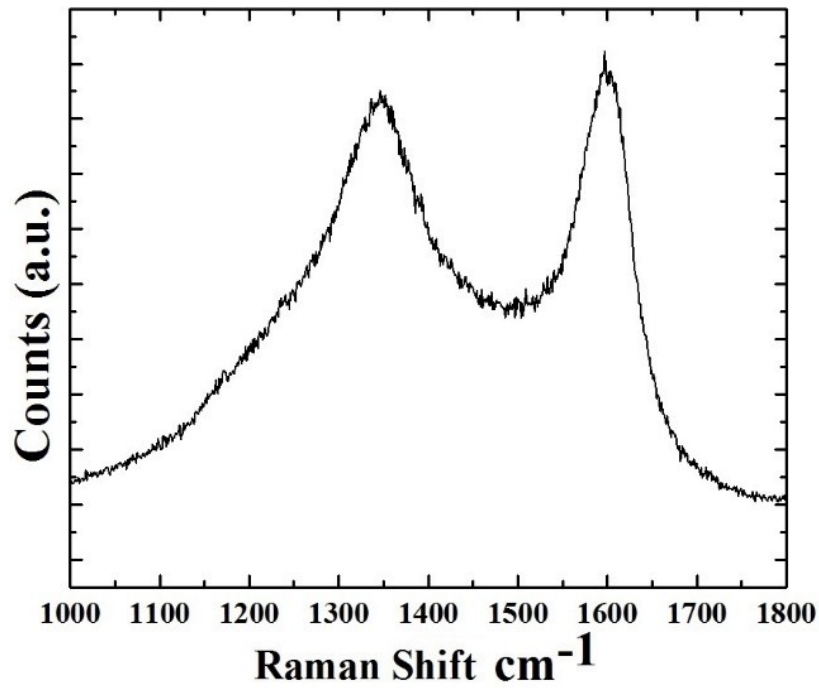


Fig.Supp.3: Raman Spectroscopy analyses confirming the presence of thin-walled CNTs structures in the radial structures. Two main bands are observed, the D band at approximately 1300 cm⁻¹ and the G band at approximately 1600 cm⁻¹.

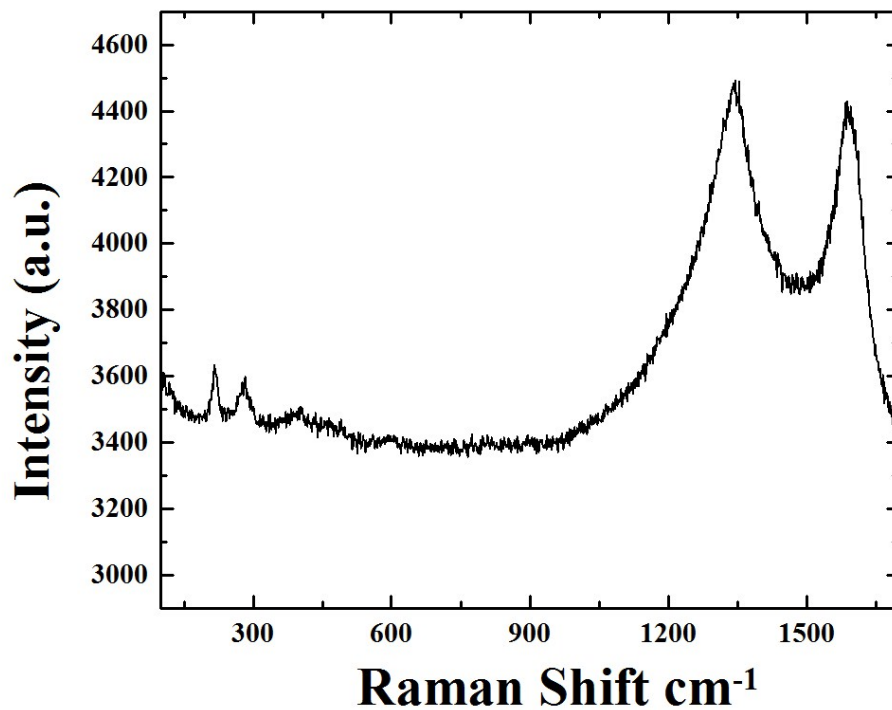


Fig.Supp.4: Extended Raman Spectroscopy analyses confirming the presence of thin-walled CNTs structures in the radial structures. Two main bands are observed, the D band at approximately 1300 cm⁻¹ and the G band at approximately 1600 cm⁻¹. The RBM modes are visible in proximity of 200 cm⁻¹.

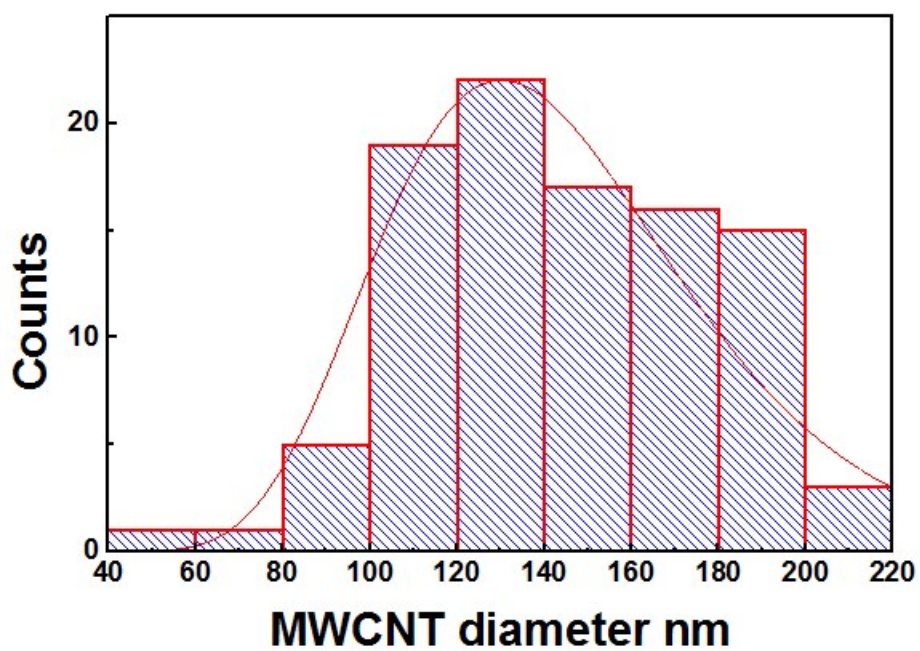


Fig.Supp.5: Statistical distribution of the outer CNTs diameter measured in the specific case of 99 CNTs comprised in the radial structures grown with only ferrocene.

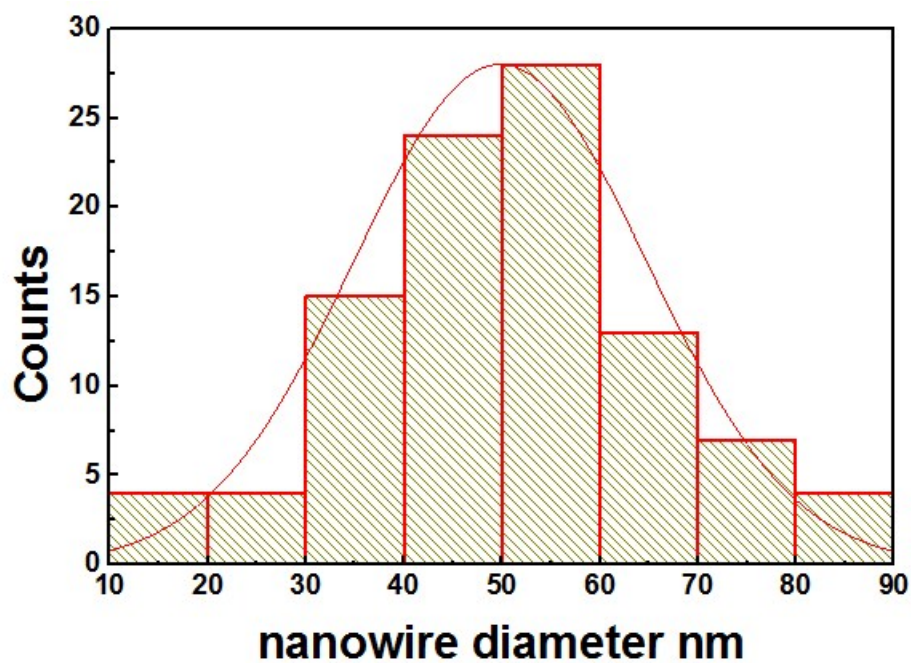


Fig.Supp.6: Statistical distribution of the nanowire diameter measured in the specific case of 99 nanowires comprised in the radial structures grown with only ferrocene.

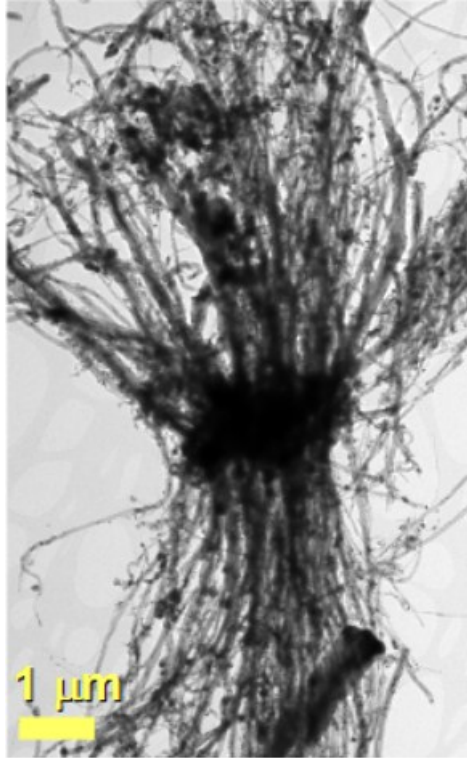


Fig.Supp.7: TEM micrograph showing an example of radial structure obtained by pyrolysis of the only ferrocene.

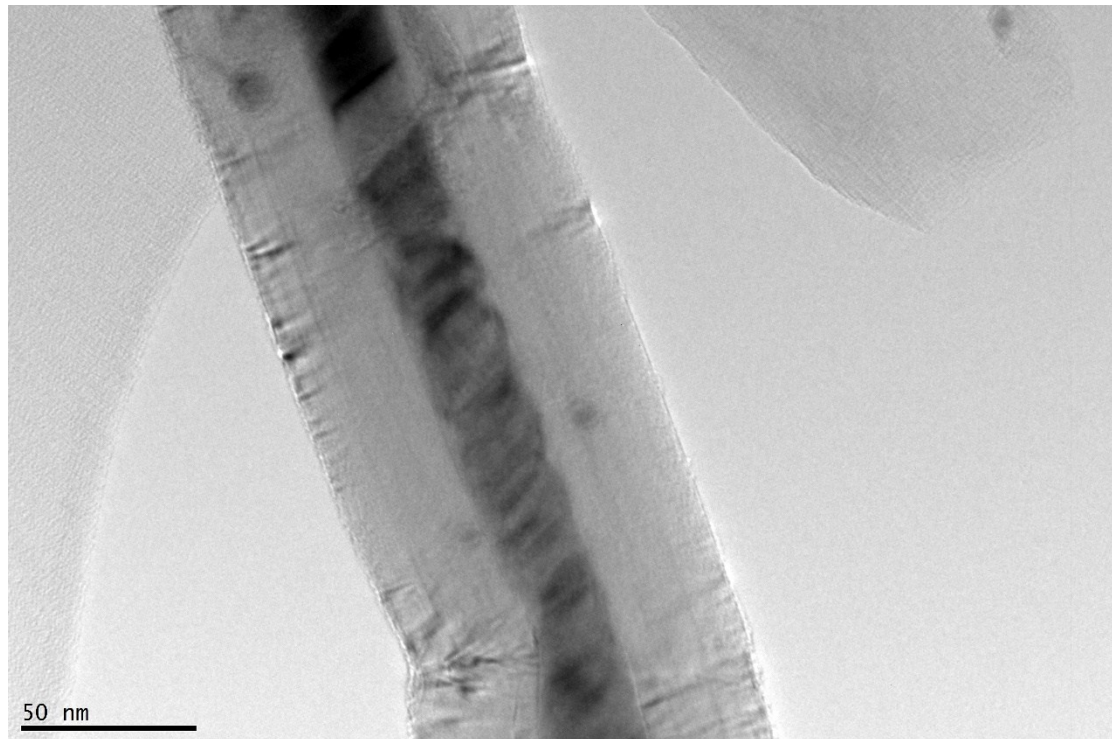


Fig.Supp.8: TEM micrograph showing the high number of CNT-walls present in the MWCNTs comprised in a typical radial structure produced by pyrolysis of the only ferrocene.

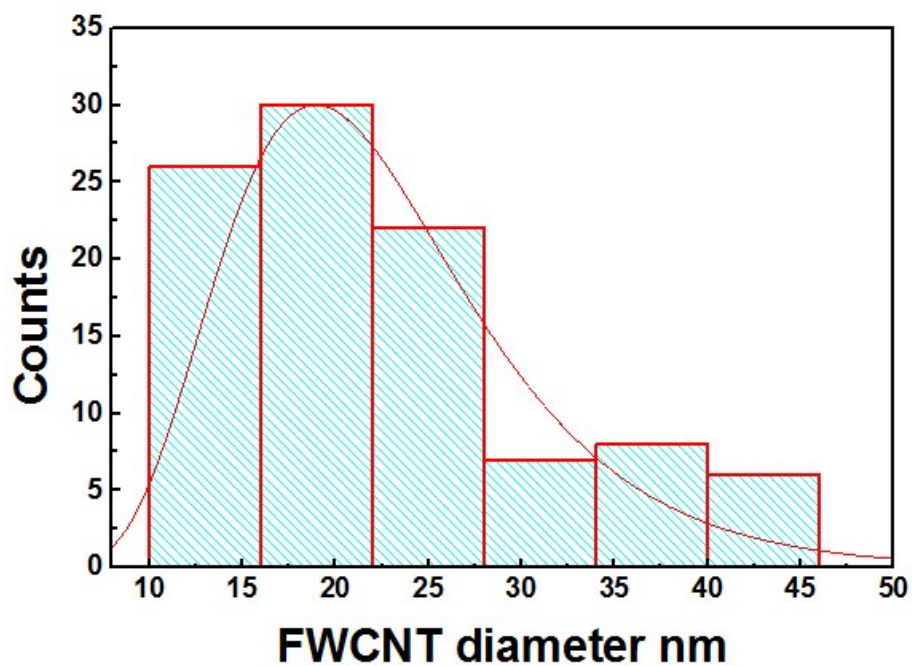


Fig.Supp.9: Statistical distribution of the outer few walls (FW) CNTs diameter measured in the specific case of 99 CNTs comprised in the radial structures grown with ferrocene/sulfur mixtures (sulfur quantity of 4 mg).

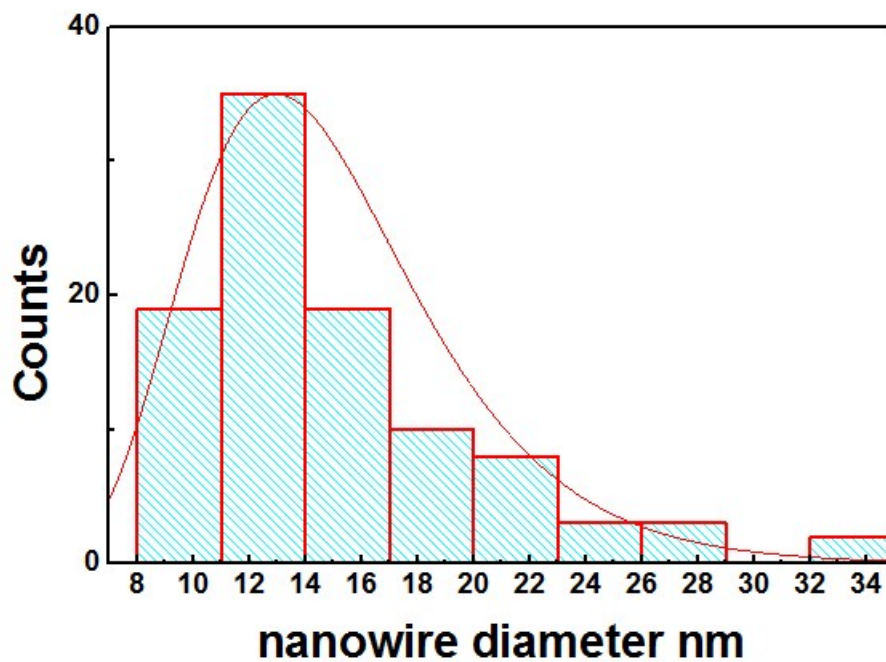


Fig.Supp.10: Statistical distribution of the nanowire diameter measured in the specific case of 99 nanowires comprised in the radial structures grown with ferrocene/sulfur mixtures (sulfur quantity of 4 mg).

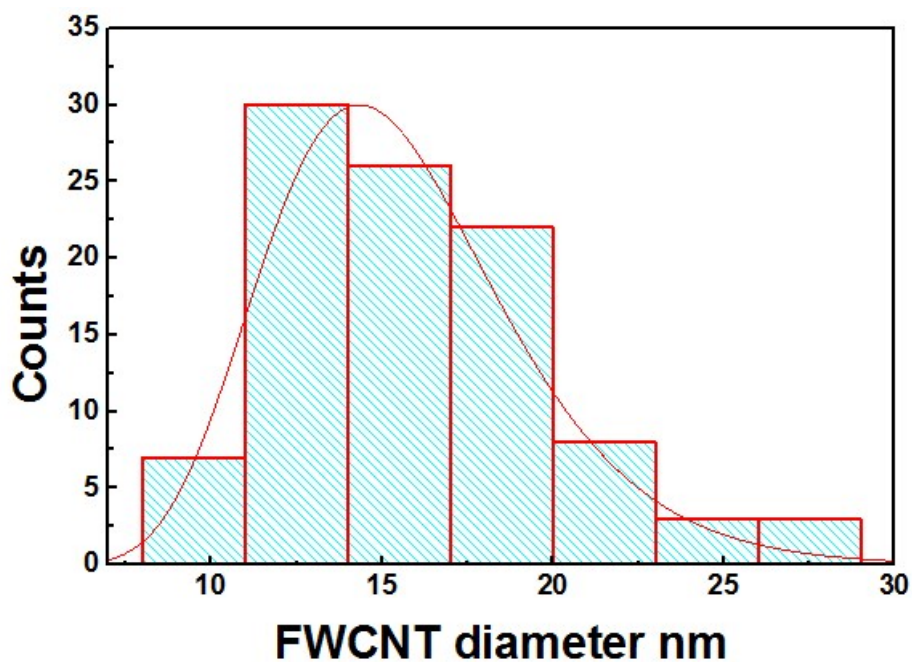


Fig.Supp.11: Statistical distribution of the CNTs diameter measured in the specific case of 99 CNTs comprised in the radial structures grown with ferrocene/sulfur (2.5 mg) mixtures. Note that CNT with diameter in the order of 8 nm were also observed in few cases. However we find that for this type of small CNT diameters an almost empty CNT-core is found.

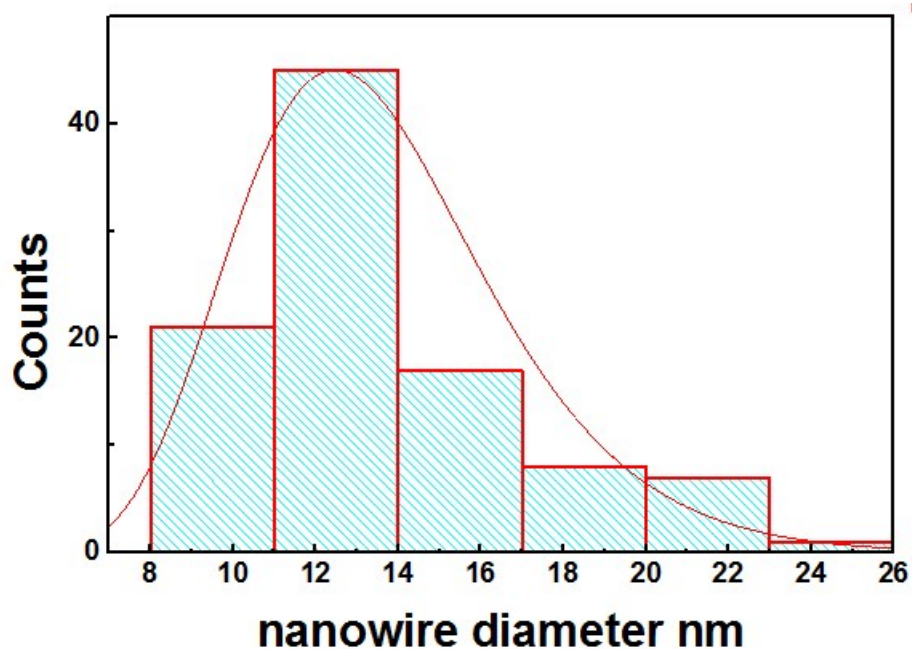


Fig.Supp.12: Statistical distribution of the nanowire diameter measured in the specific case of 99 CNTs comprised in the radial structures grown with ferrocene/sulfur (2.5 mg) mixtures. The majority of the nanowires are found with a diameter in the order of 12-13 nm. However nanowires with smaller or slightly larger diameter were also observed.

Sulfur	Number of CNT Walls
0 mg	multiwalled (>50 walls)
2.5 mg	1-5 walls
4 mg	2-9 walls

Fig.Supp.13: Table showing the variation of the CNTs-walls number with the quantity of sulfur.

Sulfur	CNT A. Diameter
0 mg	144 nm
2.5 mg	16 nm
4 mg	23 nm

Fig.Supp.14: Table showing the variation of the CNTs-diameter (average) number with the quantity of sulfur.

Sulfur	Nanowire A. Diameter
0 mg	50 nm
2.5 mg	13.5 nm
4 mg	15 nm

Fig.Supp.15: Table showing the variation of the Nanowire-diameter (average) number with the quantity of sulfur.