



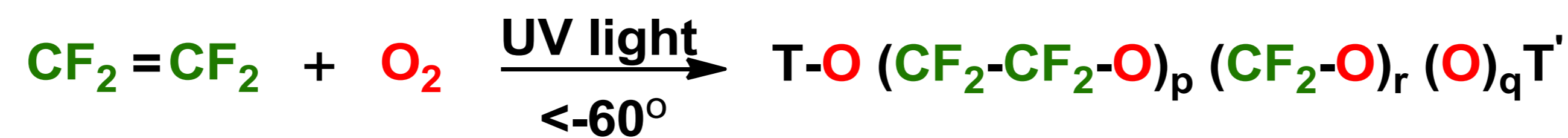
Surface Modification of Multi-walled Carbon Nanotubes by Perfluoropolyether Peroxide

S. Talaemashadi^a, M. Sansotera^a, W. Navarrini^a, C.L. Bianchi^b

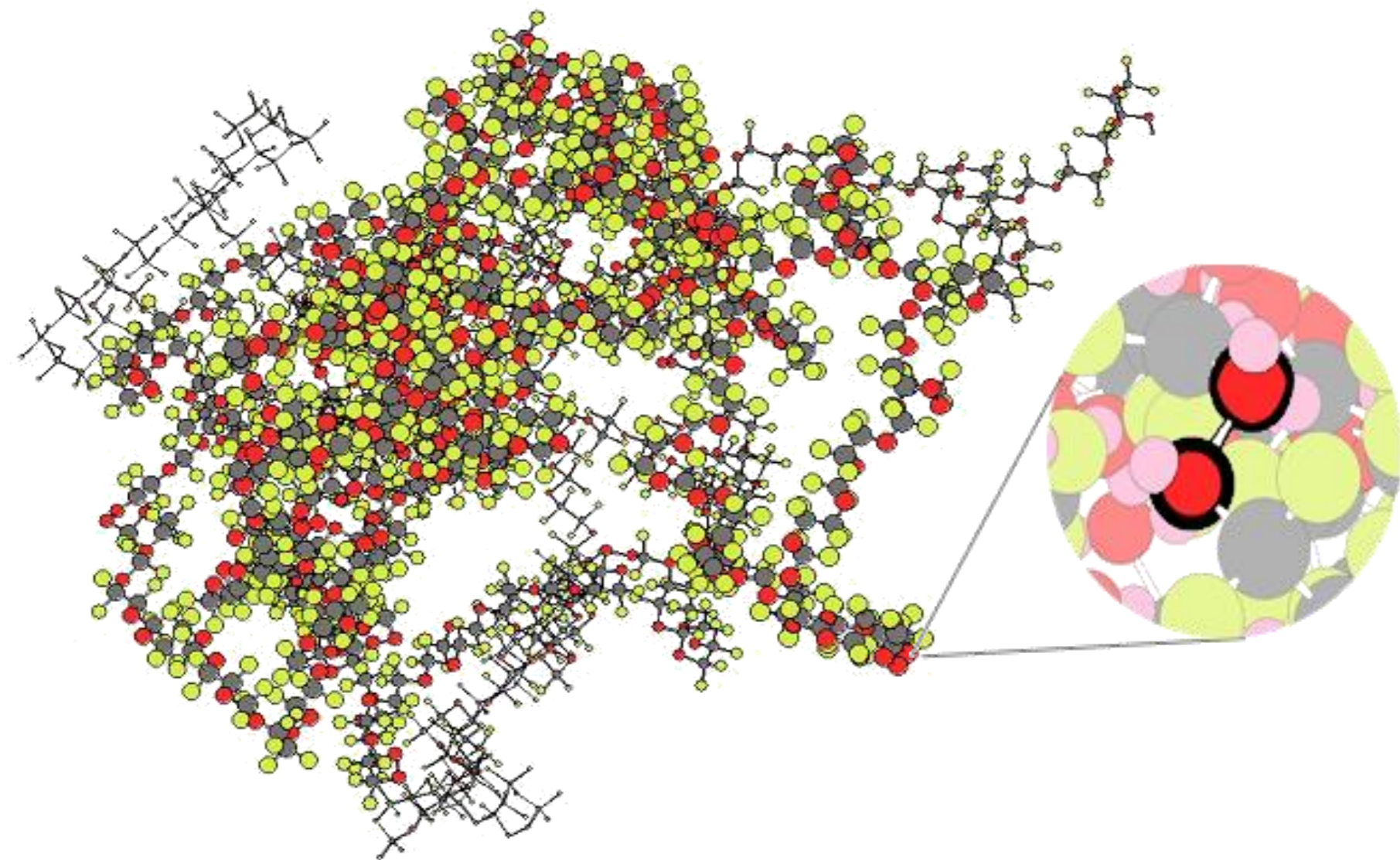
^a Dipartimento di Chimica, Materiali e Ingegneria Chimica, Politecnico di Milano, via Mancinelli 7, 20131 Milano

^b Dipartimento di Chimica Fisica ed Elettrochimica, Università degli Studi di Milano, via Golgi 19, I-20133, Milano, Italy

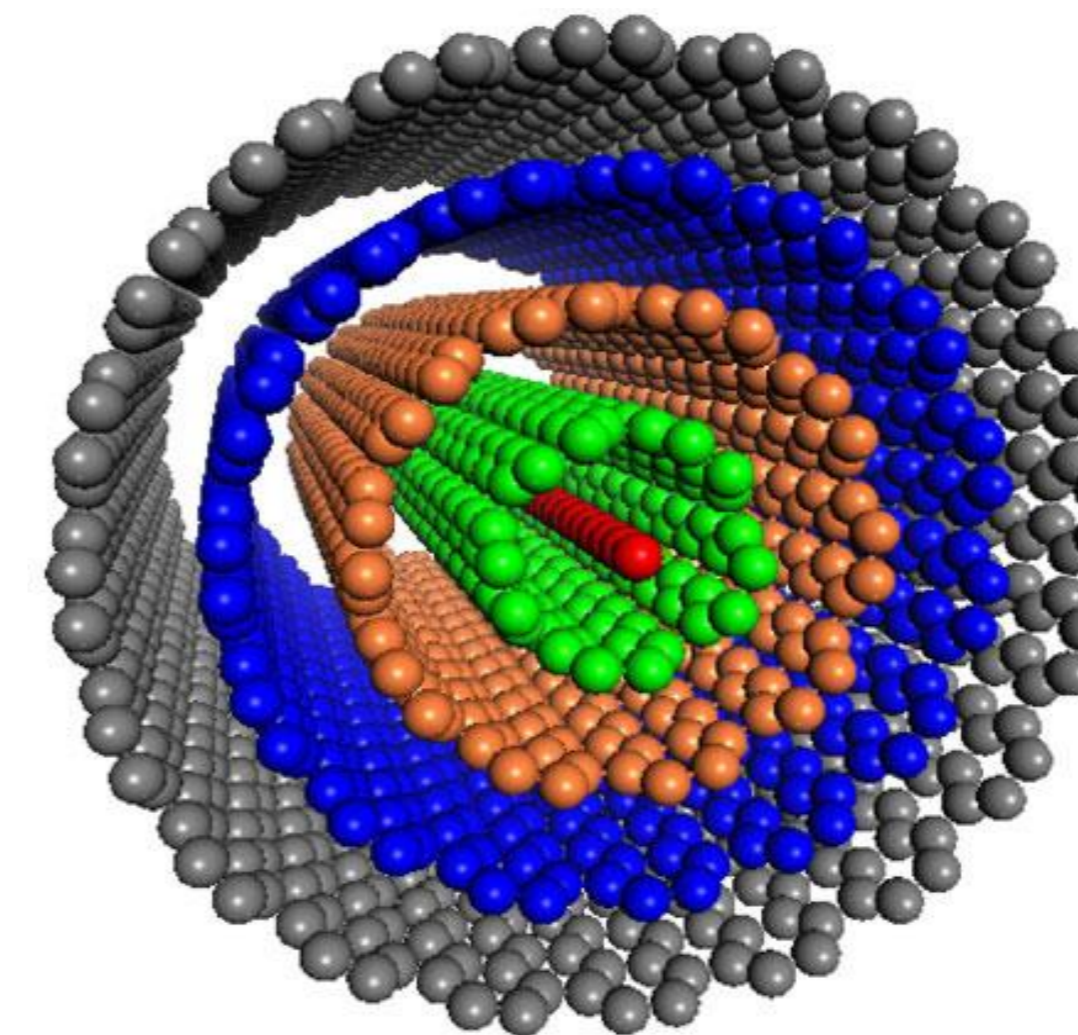
Z-Fomblin[®] Peroxide



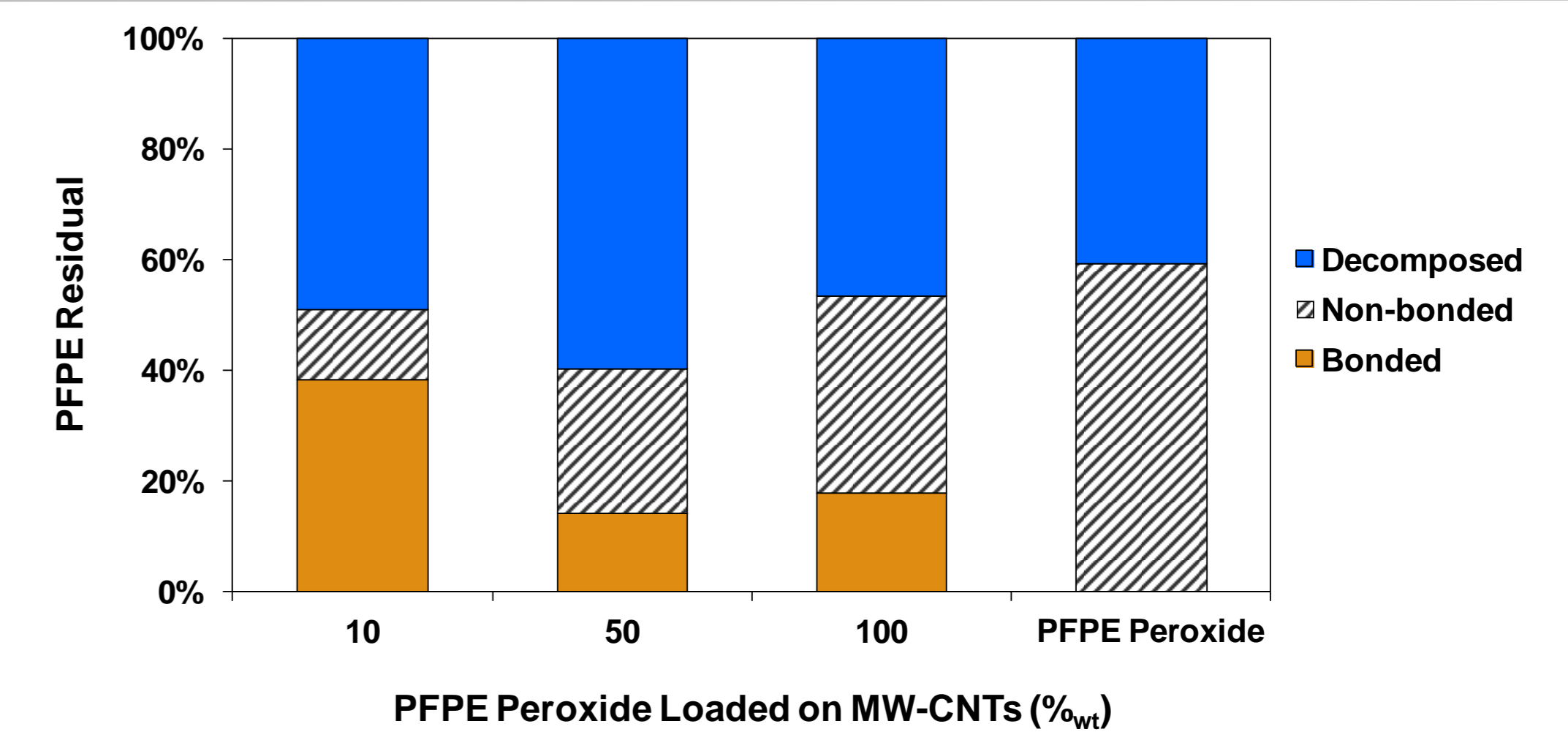
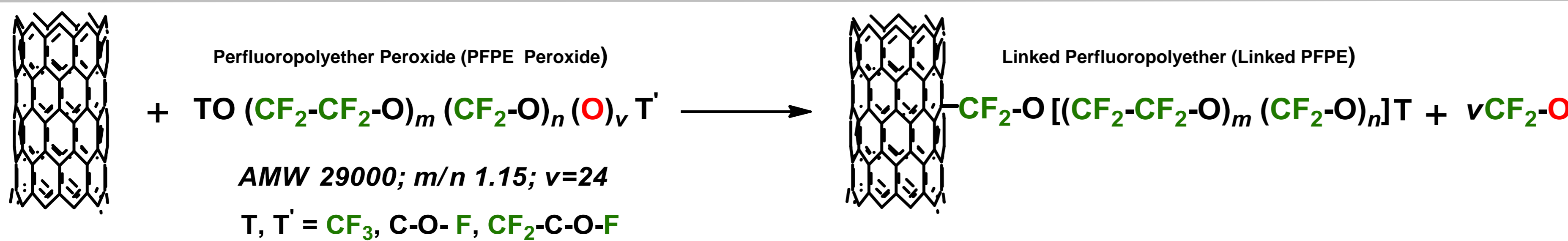
Fomblin[®] Z PFPE Peroxide was prepared industrially through the oxidative photopolymerization of tetrafluoroethylene (TFE).



Z-Fomblin[®] Peroxide
Average Molecular Weight
~29000 u
C₂/C₁
1.15
Peroxidic Oxygen
1.3% wt
Equivalent weight
~1200 u



Multi-Walled Carbon Nanotubes (MW-CNTs)
Synthesis
(CVD)
Average Diameter
9.5 nm
Average Length
1.5 μm
Carbon Purity
90%

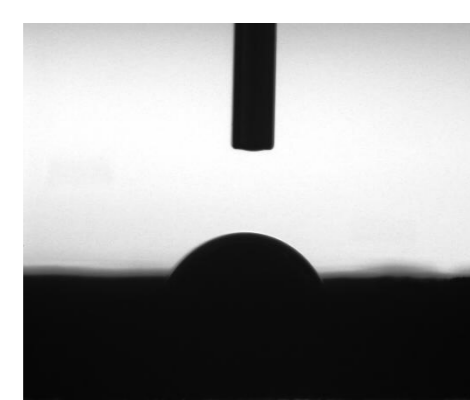


Multi-walled carbon nanotubes (MW-CNTs) were functionalized via covalent linkage of perfluoropolyether (PFPE) radicals obtained by thermal decomposition of linear PFPE peroxide.

Linked PFPE

%F_{at}-XPS

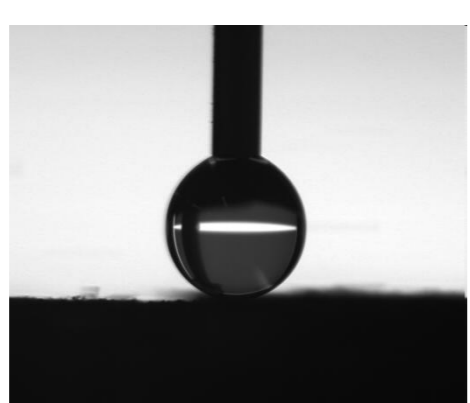
38%_{wt}



64°

1.9%

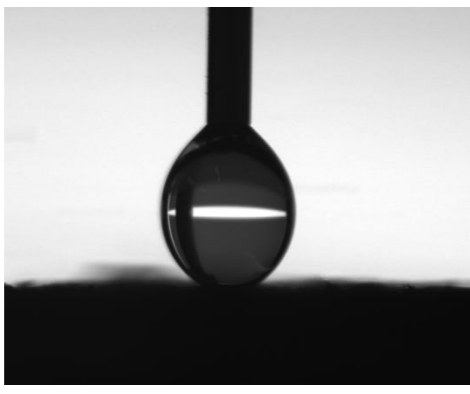
14%_{wt}



158°

4.2%

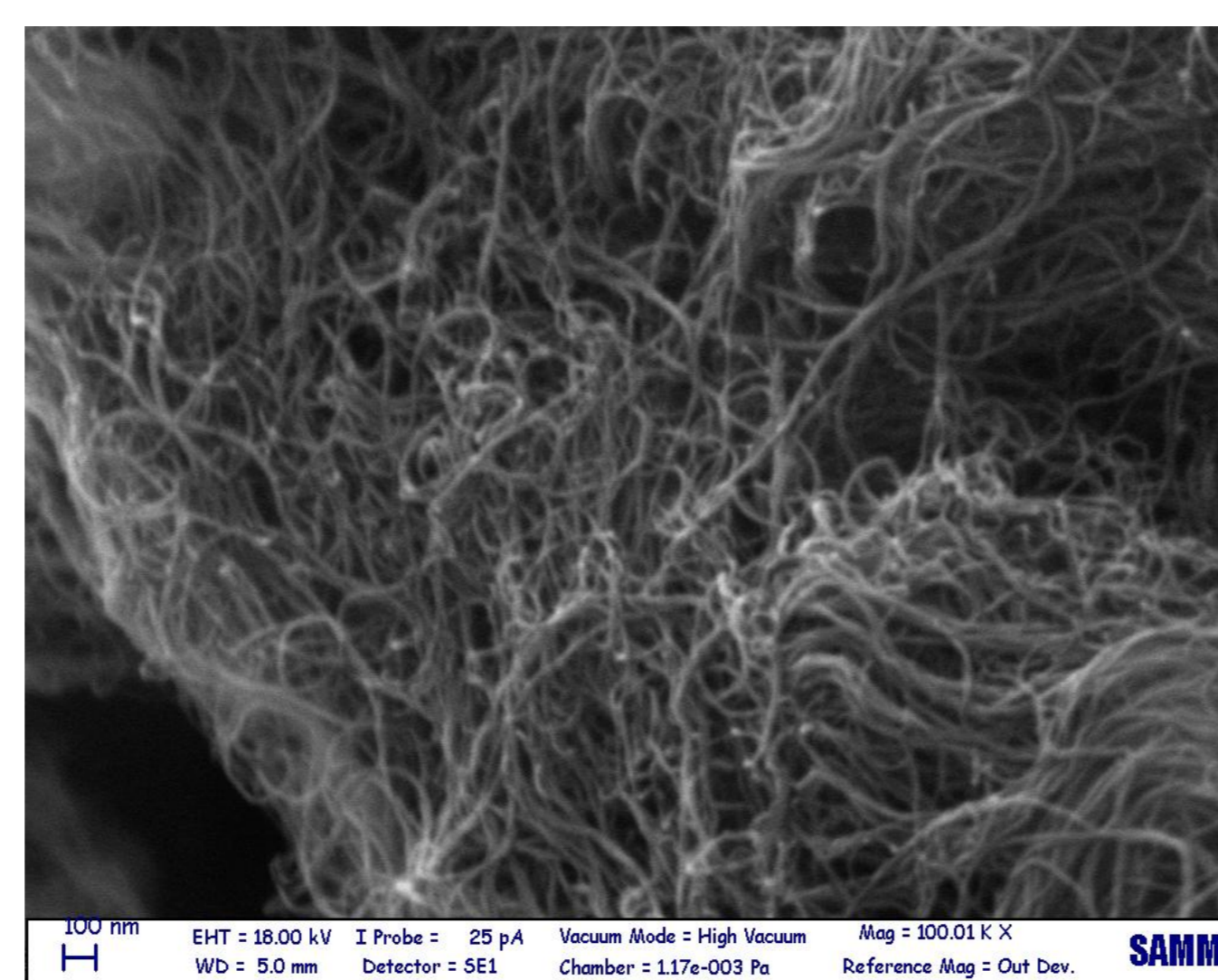
18%_{wt}



168°

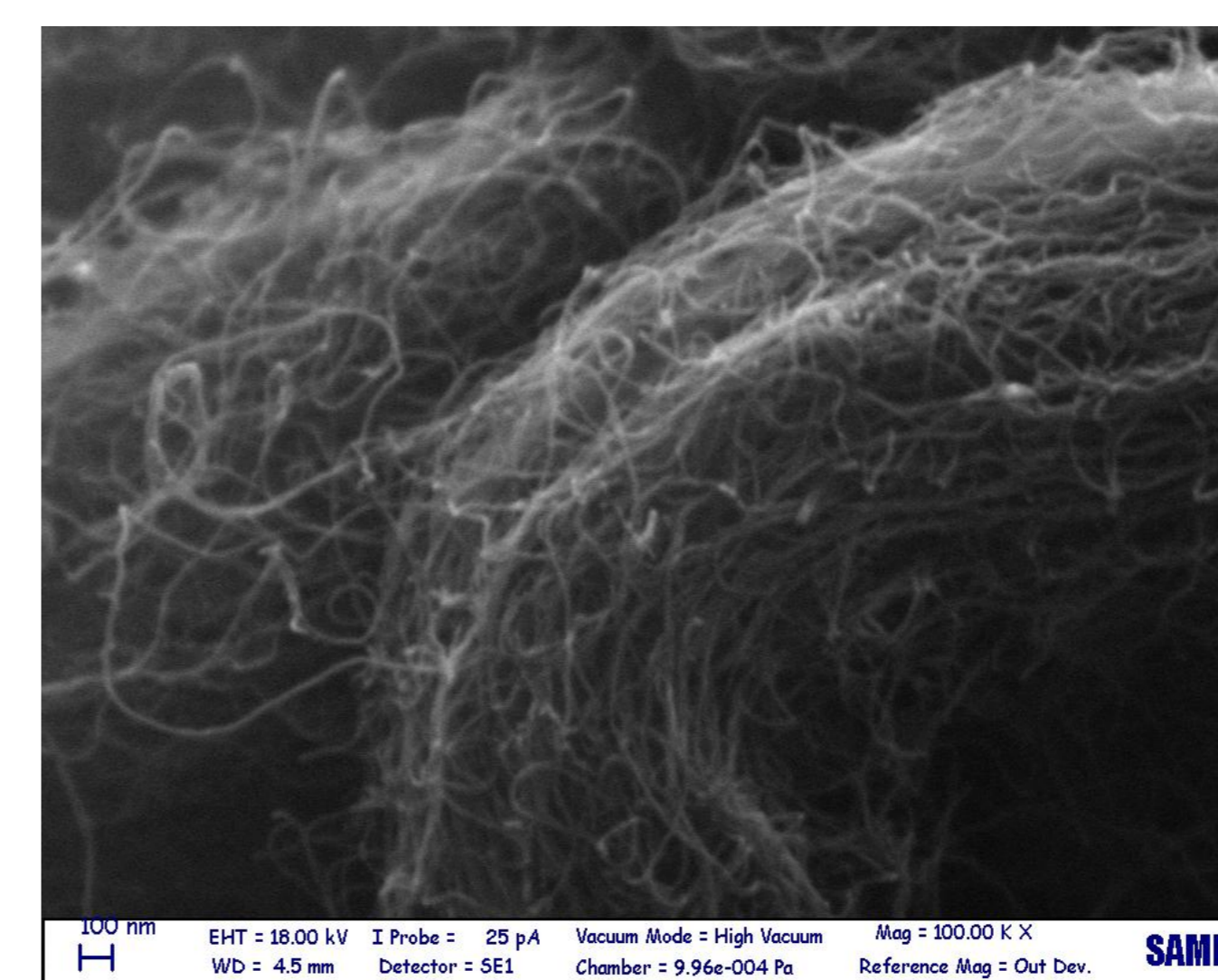
6.5%

surface area: 311 (m²/g)



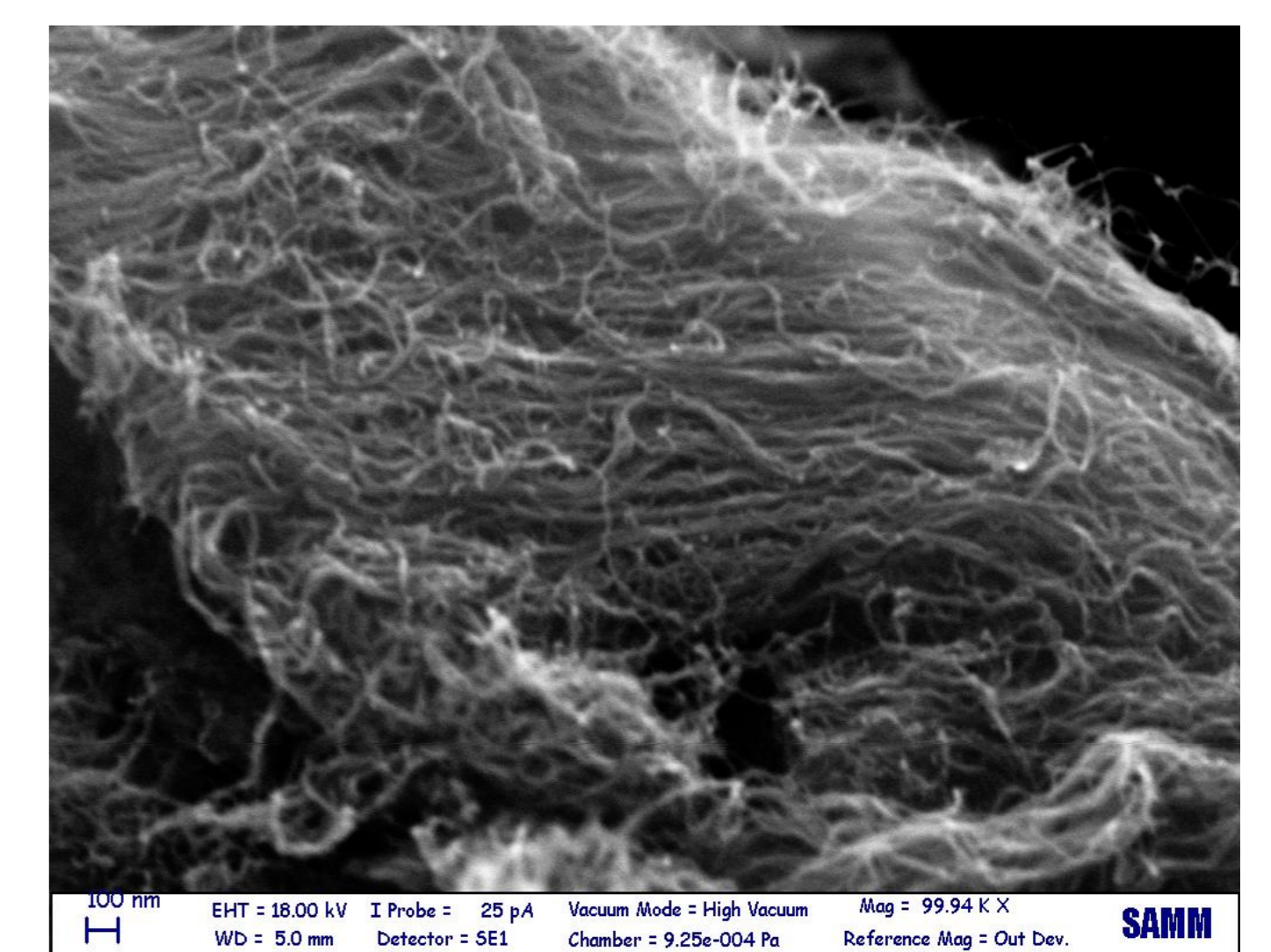
Linked PFPE 38% wt

surface area: 308 (m²/g)



Linked PFPE 14% wt

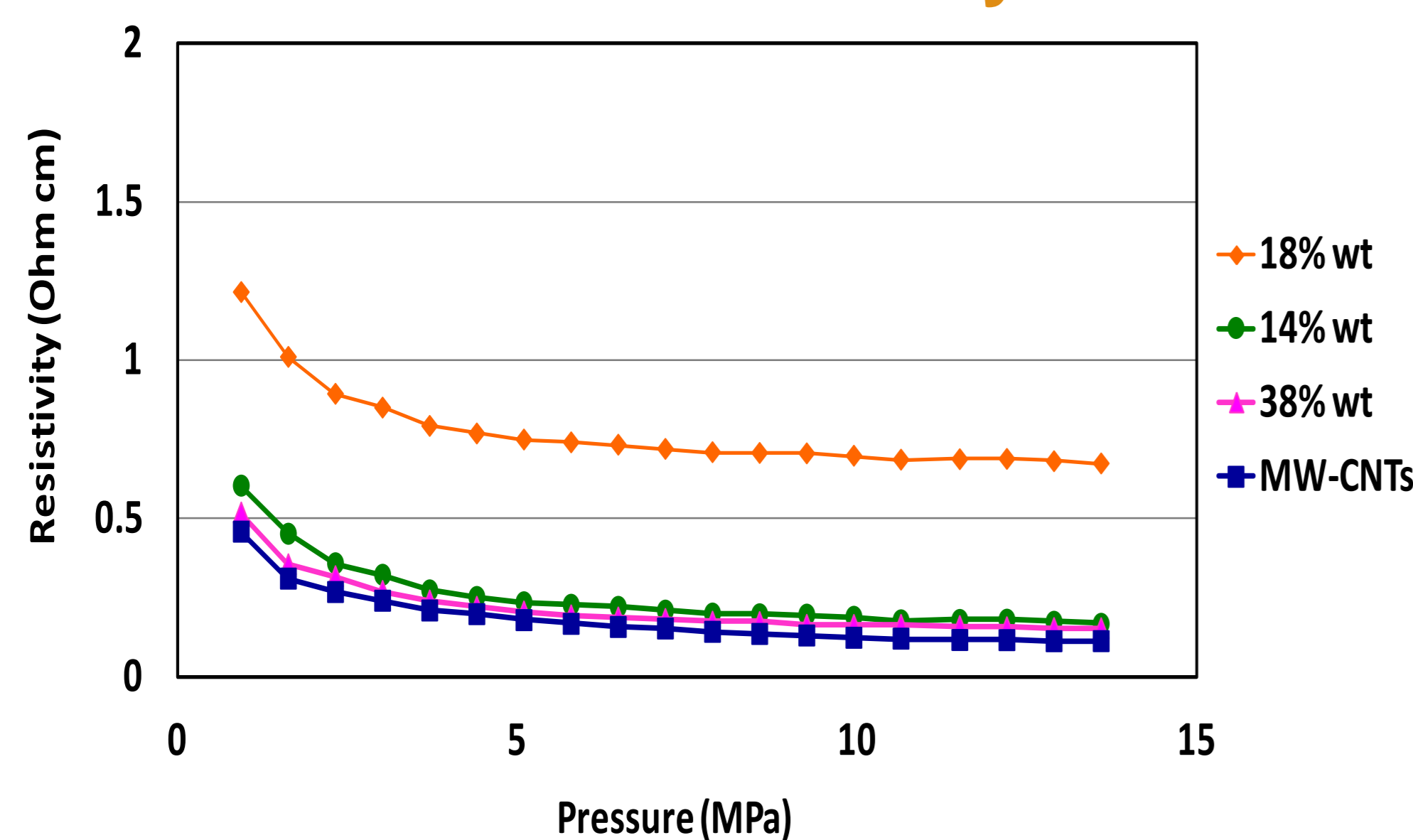
surface area: 245 (m²/g)



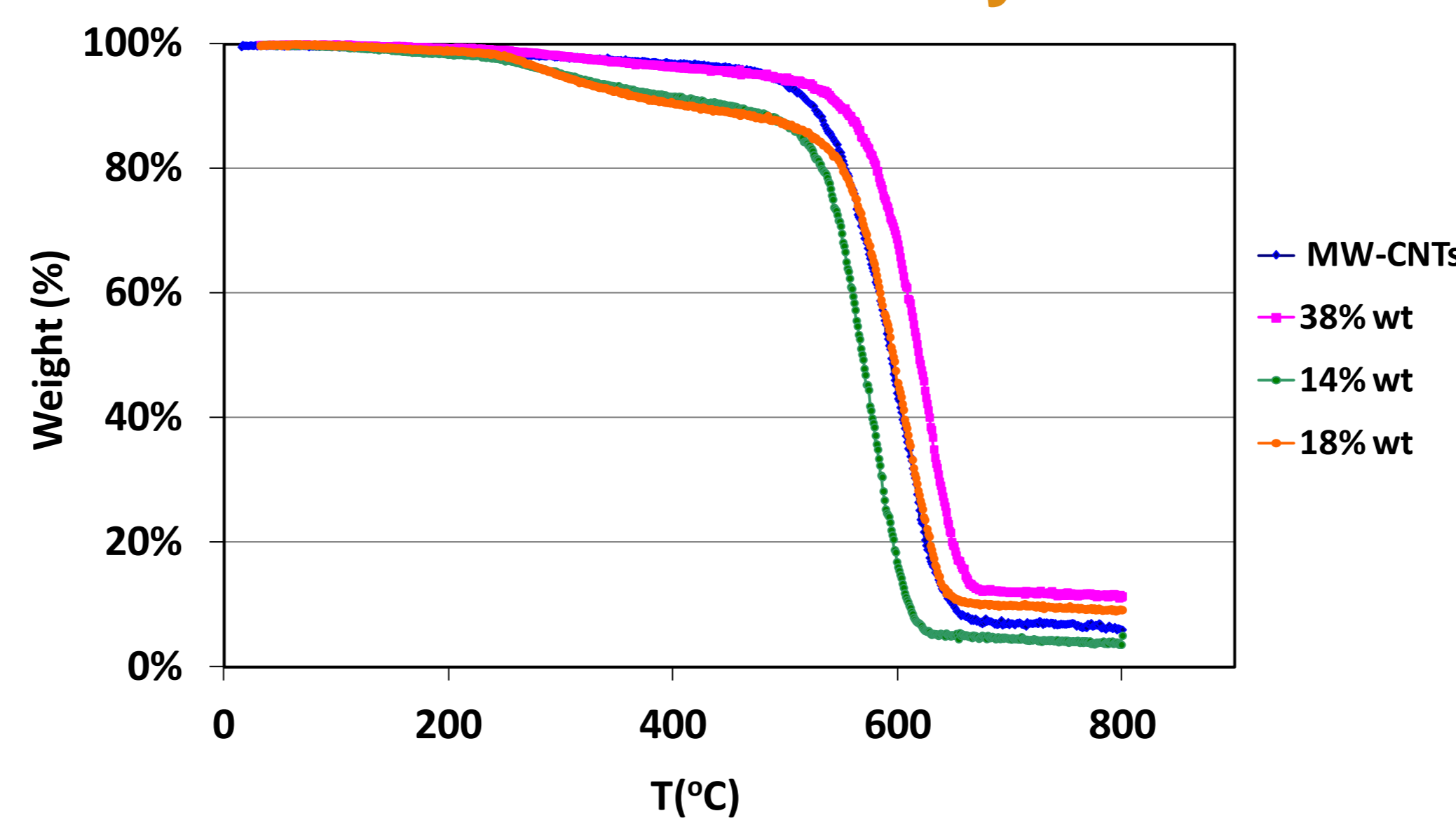
Linked PFPE 18% wt

Without any treatment, the pellet of pure MW-CNTs exhibited a hydrophilic behavior: the water droplets were adsorbed in few second (2-4 s) by the carbonaceous matrix.

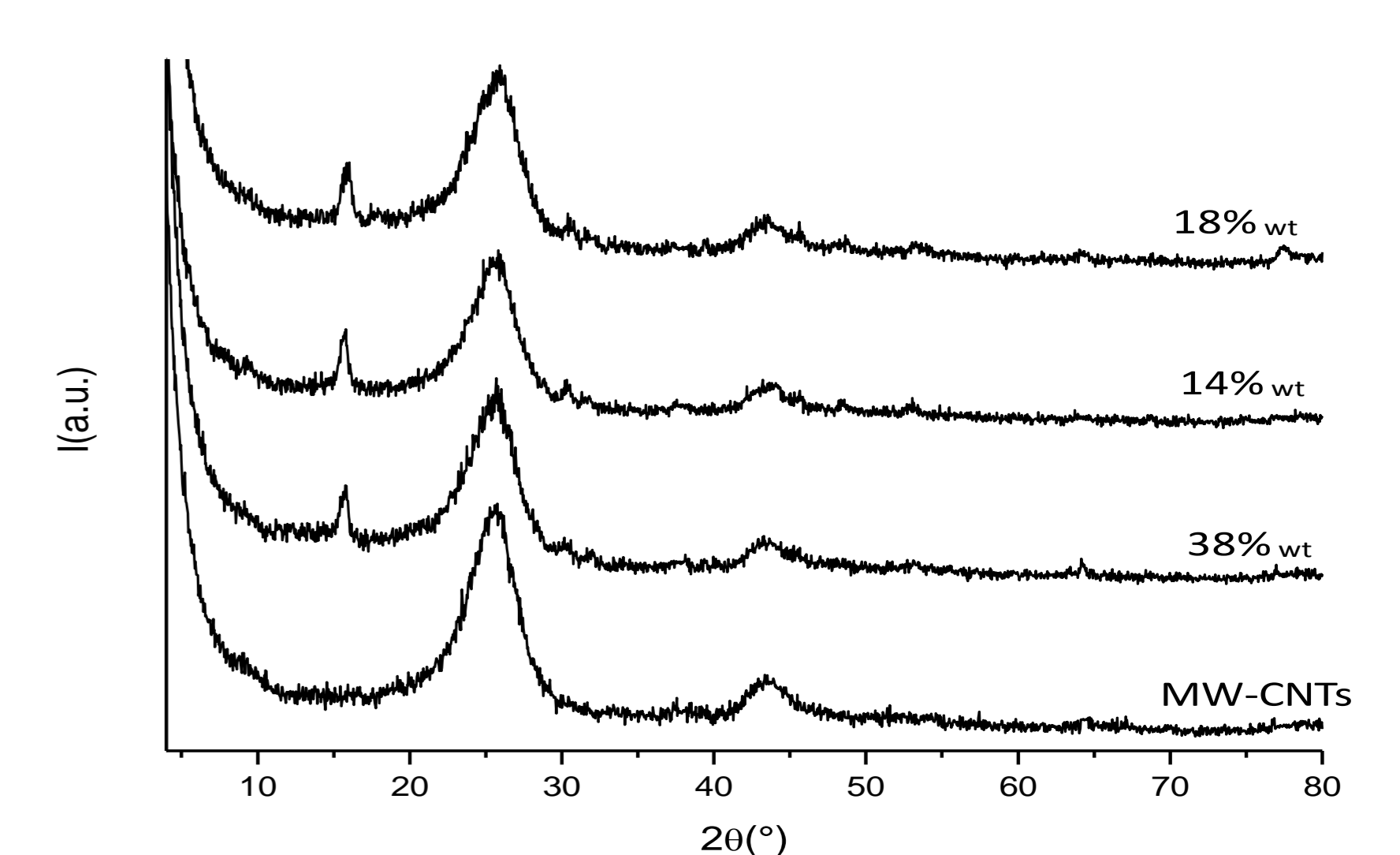
Electrical Stability



Thermal Stability



XRD Measurements



Conclusion

- Contact angle measurements have shown that the wettability of MW-CNTs changed from hydrophilic to superhydrophobic, because the low surface energy properties of PFPE have been transferred to the MW-CNTs surface.
- The resistivity measurements have shown that the conductive properties of PFPE treated MW-CNTs were maintained.
- The covalent linkage of PFPE chains weakly influenced on thermal stability of MW-CNTs.
- The XRD measurements confirmed that the functionalization of MW-CNTs with PFPE peroxide without distortion of nanotubes structure.

Acknowledgment

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