

Single-walled carbon nanotubes filled with iron chloride

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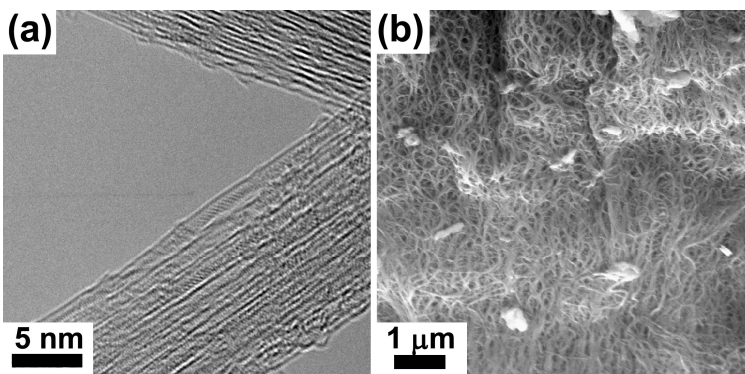
INTRODUCTION & AIM

Single-walled carbon nanotubes (SWCNTs) possess outstanding properties for water treatment applications. The properties of SWCNTs are improved through functionalization [1, 2]. Filling of the SWCNTs allows them to be functionalized with different substances. The substances have various properties to achieve modified SWCNTs with the required characteristics. The properties of the encapsulated substances, such as the melting temperature, and the work function are varied. The properties of the SWCNTs are chosen, too. Among them are the diameter, metallicity type (metallic and semiconducting SWCNTs), and ionization potential of the SWCNTs [3].

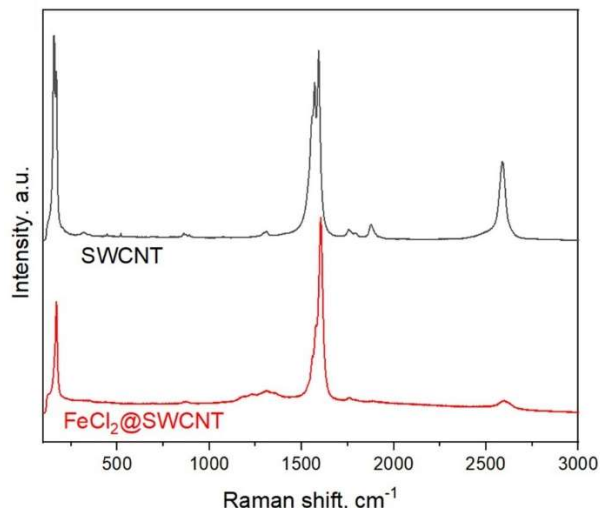
METHOD

In this work, we filled 1.4 nm diameter metallicity-mixed SWCNTs with iron chloride (FeCl_2). The novelty of this work is the chemical nature of the filled substance. Iron chloride is a 3D metal chloride with unique properties. The aim of this work was an investigation of the electronic characteristics of iron-chloride-filled SWCNTs, such as doping, and the Fermi level variation, which are important for the improvement of water treatment applications of SWCNTs.

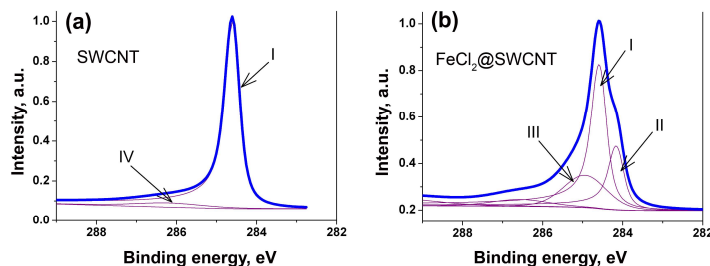
RESULTS & DISCUSSION



The transmission electron microscopy (a) and scanning electron microscopy (b) images of the iron chloride-filled SWCNTs.



The Raman spectra of the pristine, and iron chloride-filled SWCNTs acquired at the laser wavelength of 785 nm.



The C 1s X-ray photoelectron spectra of the pristine, and iron chloride-filled SWCNTs.

CONCLUSION

We showed that iron chloride was a strong p-doping substance, which caused a Fermi level variation of -0.43 eV. The obtained data on the electronic characteristics of the iron chloride-filled SWCNTs are important for water treatment applications.

REFERENCES

1. M. V. Kharlamova et al. Russian Nanotechnologies, 2009, 4(9-10), 77-87.
2. M. V. Kharlamova. Progress in Materials Science, 2016, 77, 125-211.
3. M. V. Kharlamova et al. Nanoscale, 2015, 7(4), 1383-1391.