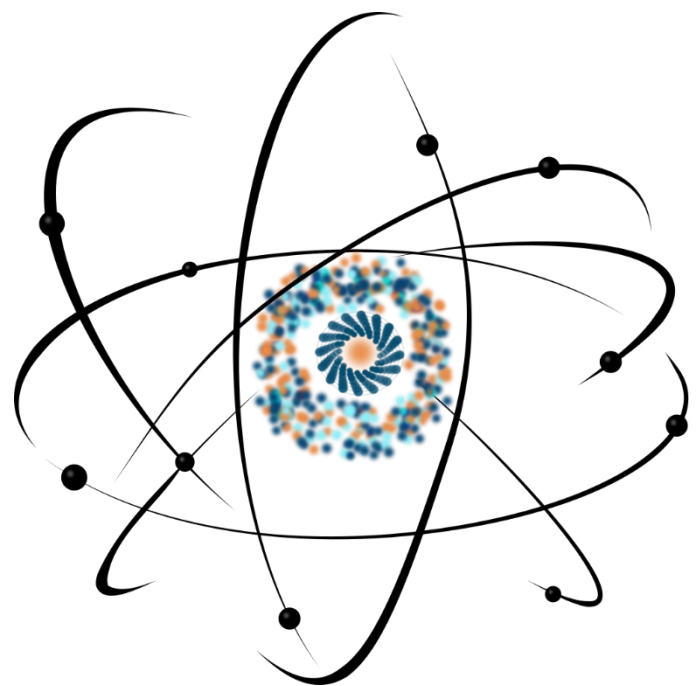




# Electro-transport properties of CNT decorated by NiFe nanoparticles



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## •Aim

The aim of this work is to define the influence of metal decoration of carbon nanotubes (CNTs) on the electrical conductivity and shielding properties of segregated composite materials (SCM) CNTFe<sub>20</sub>Ni<sub>80</sub>-UHMPE

## •Object

Polymer matrixes: ultra-high molecular weight polyethylene (UHMPE)

Fillers: CNTs and Fe<sub>20</sub>Ni<sub>80</sub>-decorated CNTs

## •Electrical properties

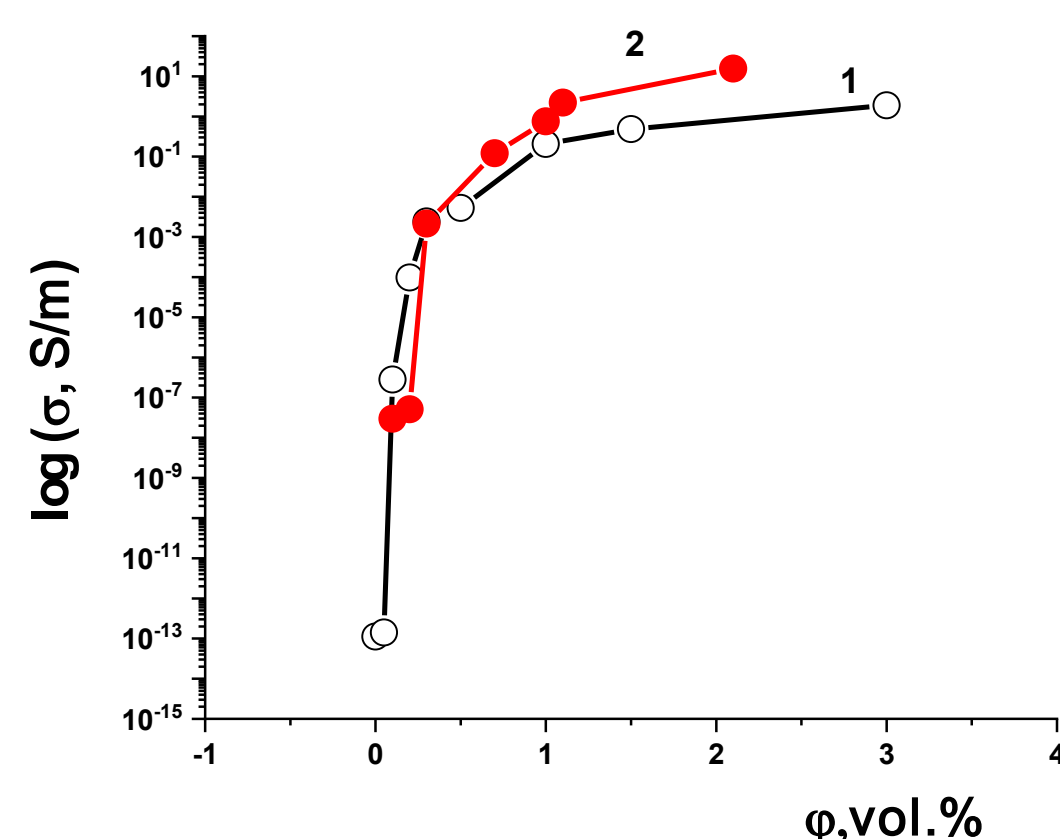


Fig. 1. Concentration dependences of conductivity for the segregated UHMPE-based composites filled with, CNTs(1) and CNTs-NiFe(2)

## •Method of preparation

Mechanical mixing of PE and CNT powders in homogenizer ULTRA TURRAX tube drive, hot pressing at 120 °C during 10 min at 110 MPa with subsequent cooling down to the room temperature

The thickness of the samples is 1 mm

## •Research method

The DC electrical conductivity was measured using a two-contact scheme. Microscopic studies of composite samples were performed by using optical microscope ("Mikmed-1" with ETRK PCM-510 attachment). The EMI shielding properties of the composites were tested in a frequency range of 26-37 GHz at room temperature using P2-65 device

## •Morphological study

Scanning electron microscopy

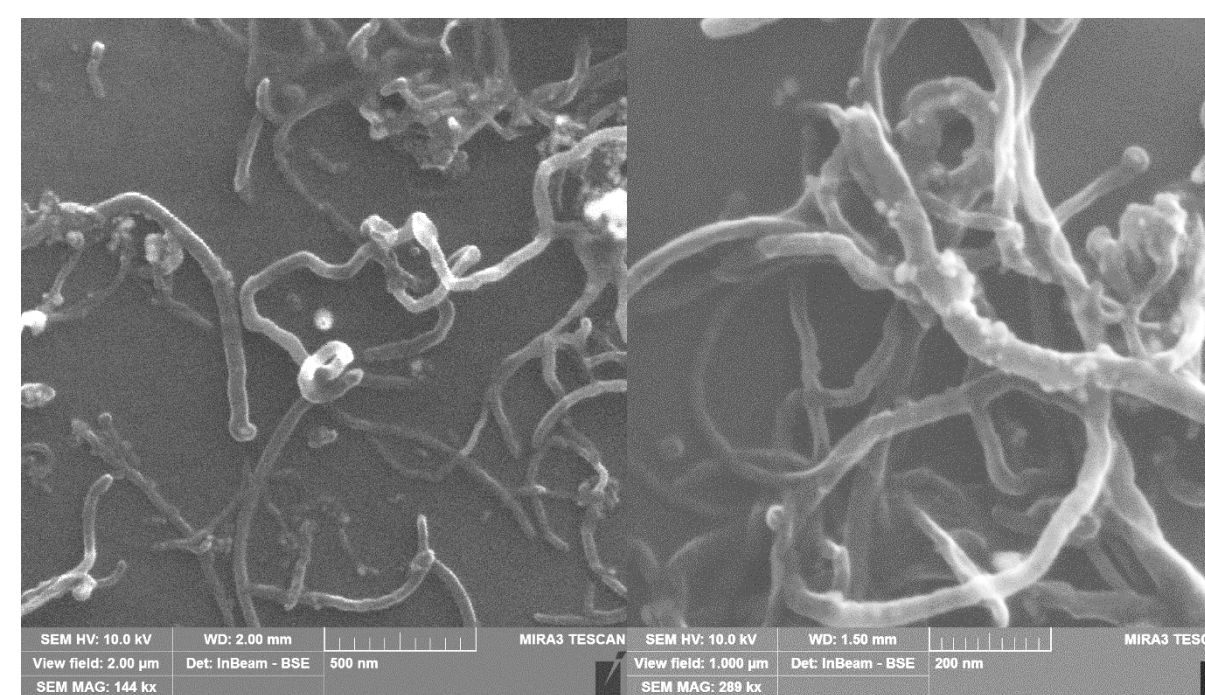


Fig. 2. SEM image CNTNiFe

Optical microscopy



Fig. 3. Polyethylene covered with CNTNiFe

## •Electromagnetic shielding properties

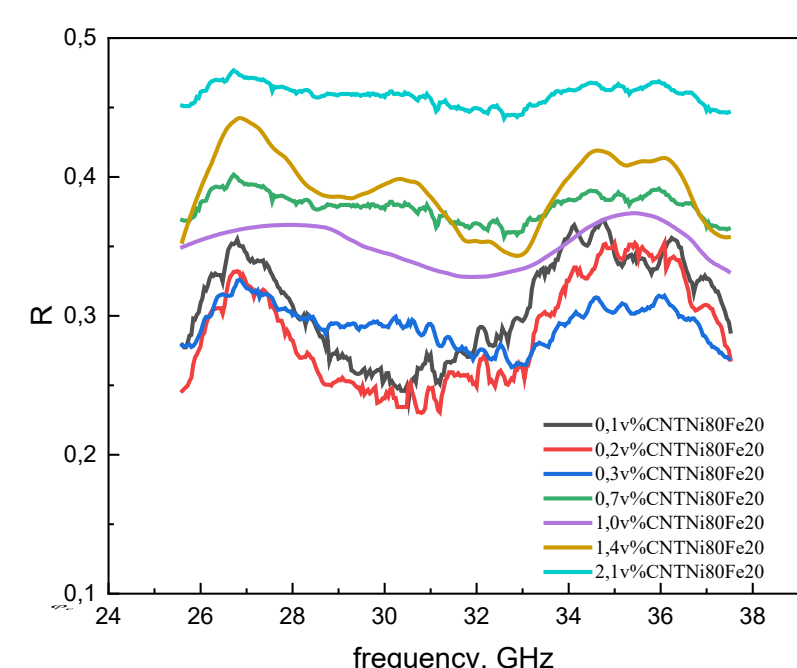


Fig. 6. The frequency dependences of the reflection of SCM

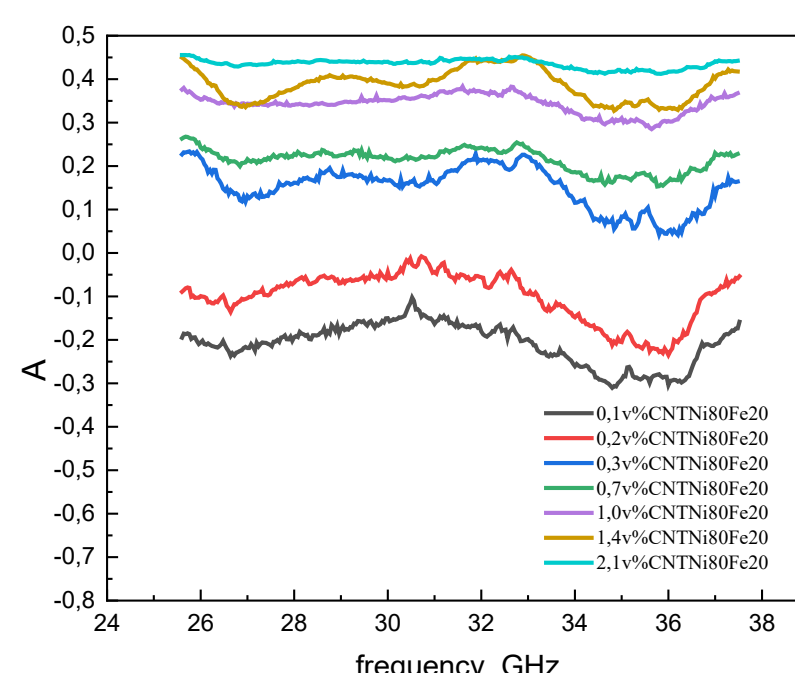


Fig. 7. The frequency dependences of the absorption of SCM

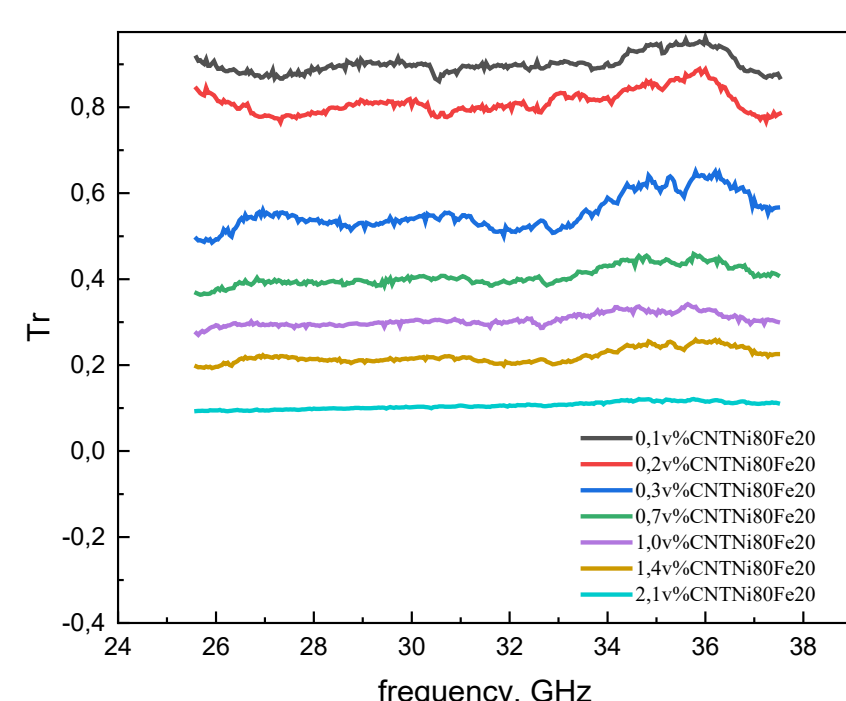


Fig. 8. The frequency dependences of the transmittance of SCM

Optical microscopy

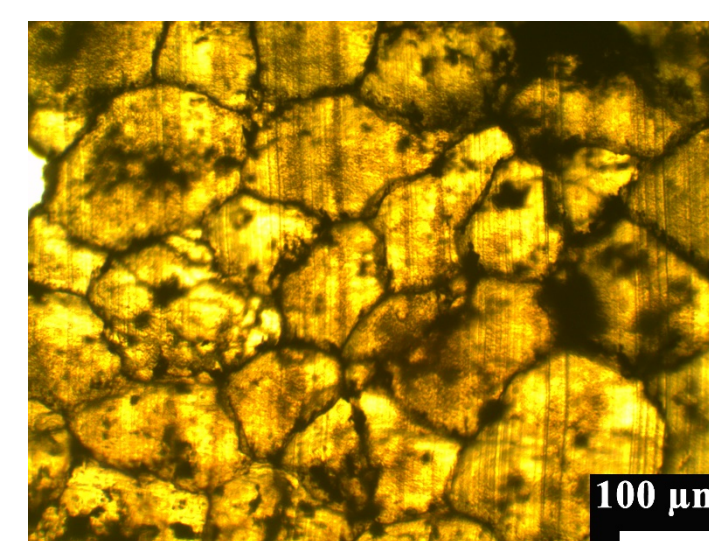


Fig. 4. SCM 0,7v%CNTNiFe/UHMPE

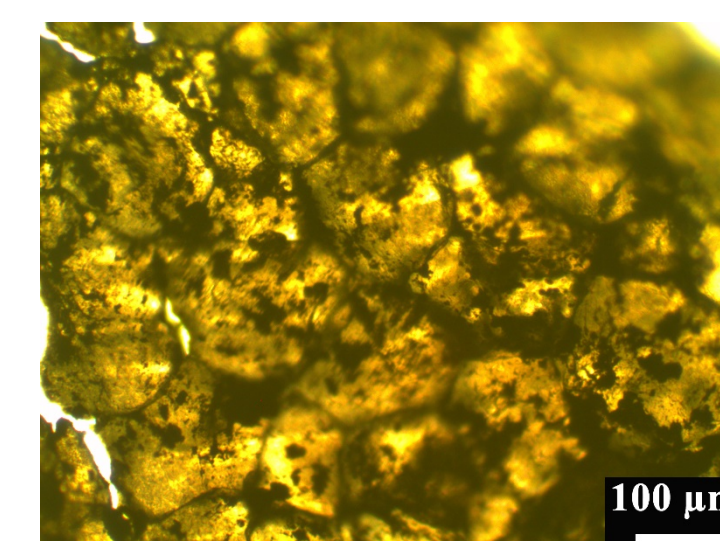


Fig. 5. SCM 1v%CNTNiFe/UHMPE

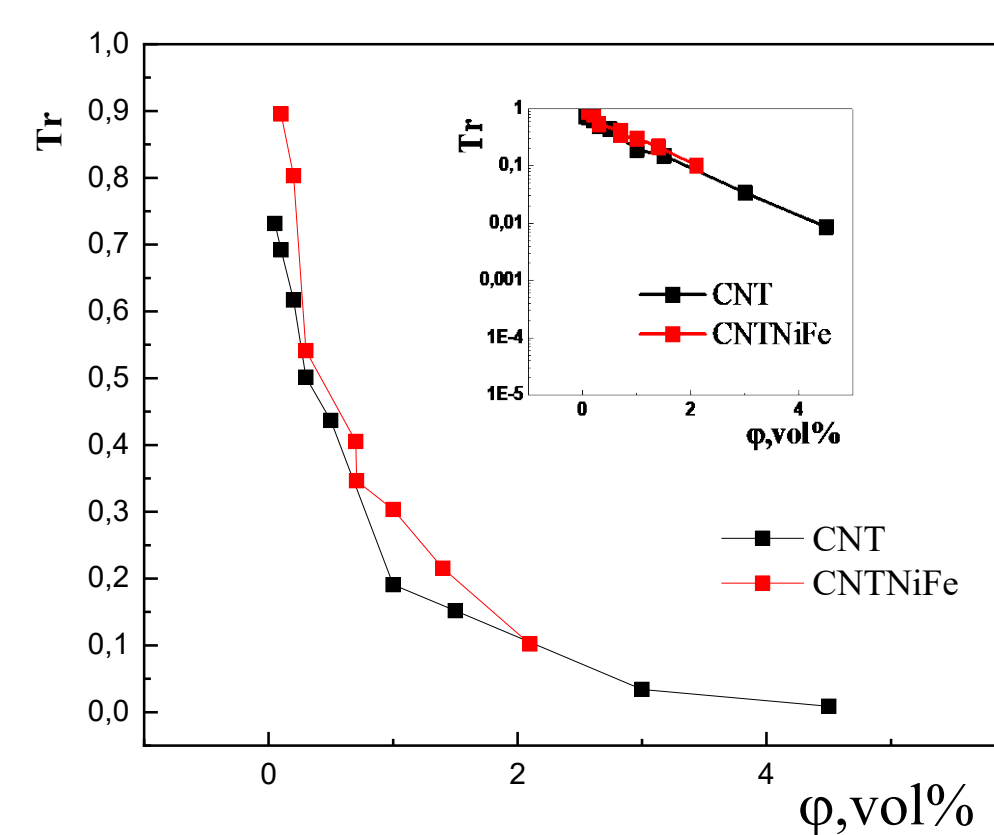


Fig. 9. The concentration dependence of the transmittance of SCM

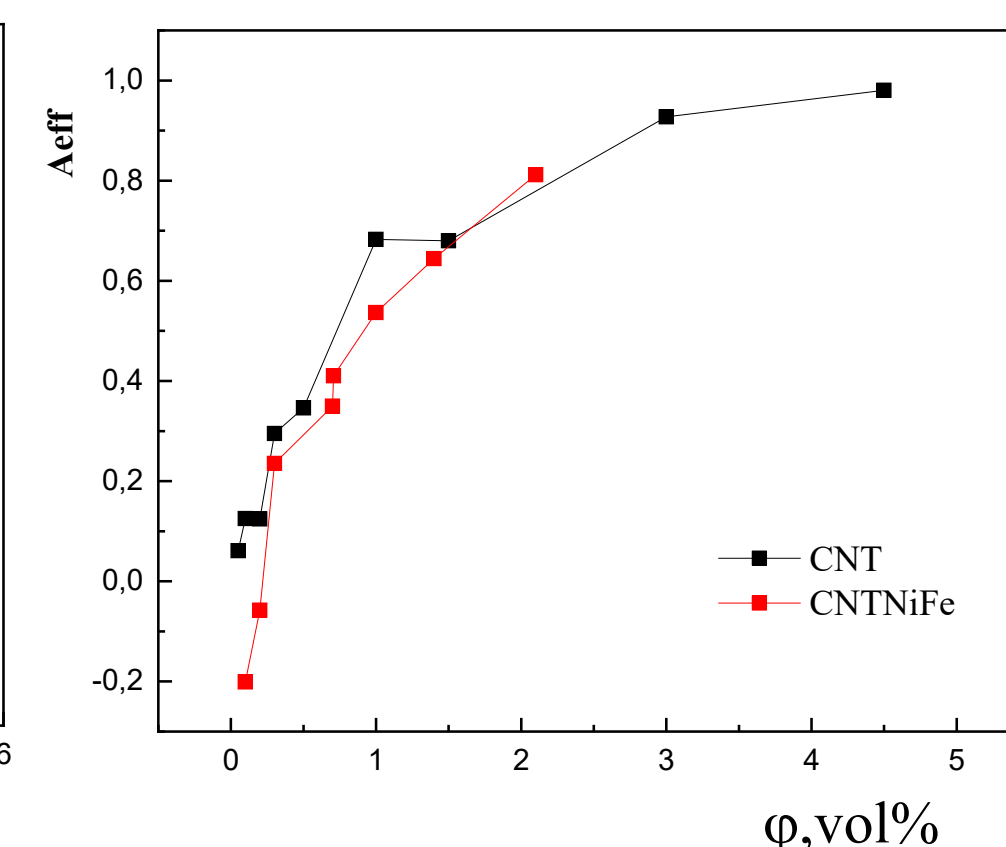


Fig. 10. The concentration dependence of the A<sub>eff</sub> of SCM

## •Conclusion

Segregated composites with CNT and CNT decorated with metal Fe<sub>20</sub>Ni<sub>80</sub> were manufactured and their structure, morphology, electrical and shielding properties are investigated.

It is shown:

- the metal component is in the form of granules and is fairly evenly distributed over the surface of the GNPs plates.
- the presence of a metal component in the form of individual nanoparticles leads to a insignificant shift of the percolation threshold of electrical conductivity and to a significant increase in the value of electrical conductivity observed at higher concentrations 0,3v%.
- the transmission coefficient decreases exponentially with an increase in the concentration of nanotubes in the composite.

