

## Nanocomposites and nanomaterials

### Electromagnetic interference shielding of cross-linked polyurethane/carbon nanotubes/ $\text{Fe}_3\text{O}_4$ composites

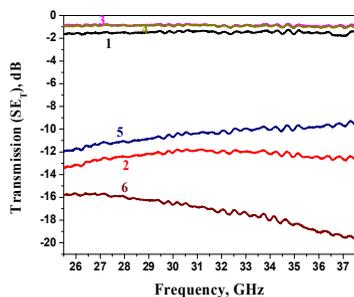
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In the recent years, significant increase of the usage of electronic devices for wireless communication, radar surveillance and household purposes arise the problem of the electromagnetic interference (EMI) pollution of the environment. In order to safe human health and improve the reliability of sensitive to EMI devices metal and conductive polymer composites based shields are used. Among the polymer composites based EMI shielding materials, the ones filled with carbon nanoparticles as carbon nanotubes, nanofibres or graphene have more advantages because of high conductivity levels at low filler content. On the other hands, the ferromagnetic nanoparticles have additional absorption of the electromagnetic waves due to increase of permeability of composite.



**Fig.** The electromagnetic shielding efficiency for CPU0 (1), CPU/5%CNT (2), CPU/5%Ni (3), CPU/10%Ni (4), CPU/5%CNT/5%Ni (5), CPU/10%CNT/10%Ni (6).

the electrical conductivity of the composites. For the composites CPU/5%CNT5%Ni (curve 5) the value of  $SE_T$  does not significantly increase (to  $-10 \div -12$  dB), comparing with CPU/CNT composites. But the addition of 10%wt. of CNTs and 10%wt. Ni (curve 6) leads to increasing of  $SE_T$  from -2 dB to  $-16 \div -20$  dB.

In this work, the cross-linked polyurethane (CPU) with multi-walled carbon nanotubes (CNTs) and/or Ni nanoparticles were synthesized. Figure presents the electromagnetic shielding efficiency ( $SE_T$ ) of CPU composites with CNTs and/or Ni nanoparticles in the frequency range of 25.5 – 37.5 GHz.

The values of  $SE_T$  for the composite CPU/Ni with 5 and 10%wt. of nanoparticles (curve 3 and 4) are low. But the value of  $SE_T$  for the composite with only 5%wt. of CNTs is equal to -13 dB. This effect may be linked with the increasing of the