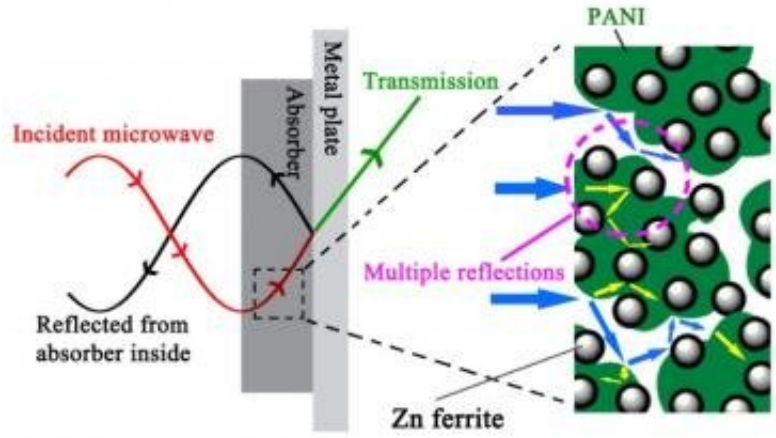
Composite significantly reduces electromagnetic pollution

September 28 2018



A schematic diagram of phase cancellation and microwave attenuation process. The fluffy structure of PANI/Fe ferrite composite can highly increase the transmission path of microwave, and the multiple reflections can enhance the microwave attenuation efficiency of the absorber. Thus, the microwave attenuation capability of PANI/Zn ferrite composites mainly comes from the enhanced effect of fluffy structure, multiple reflections, interfacial polarization, magnetic loss and dielectric loss. Moreover, if the relationship between the coating thickness and the frequency of incident microwaves matched well with the quarter-wave thickness criteria, the incident microwaves would vertically enter the absorber inside, as shown in this figure. Credit: Honglong Xing

In a paper published in *Nano*, a group of researchers from Anhui University of Science and Technology have synthesized PANI/Zn ferrite composites which have shown excellent microwave absorption

performance. They could be used to reduce electromagnetic pollution.

The PANI/Zn ferrite composites were synthesized using a two-step hydrothermal and in-situ polymerization method. Zn ferrite was used to adjust the impedance matching and improve PANI magnetic loss capability. The synergy of fluffy structure, dielectric loss, magnetic loss, interfacial polarization and the phase cancellation effect led to the attenuation of microwave energy. Furthermore, the fluffy structure enhanced the microwave transmission path and attenuation efficiency. These factors make this composite a good microwave absorber and an ideal material in the electromagnetic wave absorption field.

Microwave absorption materials with reflection loss (RL) values less than -10 dB reflect the absorption of 90 percent of microwave emissions . The minimum RL values of this composite can reach -54.4 dB with coating thickness of 1.4 mm. The bandwidth about RL below -10 dB was 4.8 GHz at 1.6 mm. The excellent microwave absorption performance of PANI/Zn ferrite composites suggested that it can be used as an excellent absorber with thin coating characteristics, strong absorption and broad bandwidth.

Microwave absorption materials have been studied by many workers to reduce or eliminate microwave pollution. Because of the popularity and development of electronic devices, especially mobile phones, computers and wireless routers, microwave pollution has intensified in recent years. These materials have great potential applications in information security, healthcare, electronic countermeasures and so on. The functional materials of PANI/Fe ferrite with lightweight, thin coating, high efficiency and broadband absorption properties are also easy to synthesize, which is beneficial to industrial mass production.

More information: Honglong Xing et al, Structure and Microwave Absorption Properties of Polyaniline/Zn Ferrite Composites, *Nano*

(2018). DOI: 10.1142/S1793292018501059