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Core-shell nanostructured CS/MoS₂: a promising material for Microwave absorption

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Abstract:

To meet the need of exploiting high performance electromagnetic wave (EMW) absorbers, lightweight and easily obtainable materials are increasingly researched. As common but important substances for EMW absorption, carbon and MoS₂ have been individually investigated over decades because of their excellent dielectric loss properties and large surface areas, but few works focused on carbon/MoS₂ hybrids. In this research, three types of carbon sphere self-assembly coated by MoS₂ nanosheets (CS/MoS₂) hybrids were synthesized via a simple hydrothermal method. The hybrids with a core-shell structure have been presented with notable microwave absorption properties (MAP) for the first time. As an absorber, the CS/MoS₂-wax composite with 30 wt% filler ($M_c: M_{MoS_2} = 1.6: 1$, molar ratios) loading has achieved a minimum reflection loss (RL) value of -52.6 dB and an absorption bandwidth with effective attenuation (RL < -10 dB) of 4.9 GHz (13.1-18 GHz) at a thin thickness of 1.4 mm. In addition, the plausible mechanism for the CS/MoS₂ composites with excellent MAP are discussed.

Keywords: CS/MoS₂ hybrid; core-shell nanostructure; microwave absorption; carbon materials; electronic materials; absorption bandwidth

1. Introduction

In recent years, the ubiquitous pollution of electromagnetic wave (EMW) caused by electronic devices has not only threatened human health but also interfered with normal electromagnetic equipment. To solve out this big problem, high effective and

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