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Oriented metal organic frameworks grown on layered double hydroxides with tunable magnetic capabilities for electromagnetic wave absorption application

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In this study, we have designed order stacking and nano-porous structure by direct growing metal-organic framework (MOF) on the surface of layered double hydroxide (LDH) via through seed-mediated growth method. The phase and morphology of LDH@ZIF-67 samples were examined with X-ray powder diffraction (XRD) and field emission scanning electron microscope (FE-SEM), respectively. The FE-SEM images of LDH@ZIF-67 showed as-synthesized morphology, which found the amount of ZIF-67 increasing with molar ratios of Co. XRD pattern found that the plane of LDH (003) at 2θ= 10.5o is matched with the plane of ZIF-67 (002) at 2θ= 10.4o in LDH@ZIF-67. X-ray photoelectron spectroscopy (XPS) and Fourier-transform infrared (FTIR) spectroscopy of LDH@ZIF-67 signals are show Co-N bonding signals on 406.6 eV and 423 cm-1, respectively. It found that the magnetization 10.3 to 40.3 emu g-1, which attributed to the increased Co ratio. Therefore, the formation mechanism of LDH@ZIF-67 is probably involved partial dissolution/coordinative interaction of LDH with ZIF-67 in a solution of 2-methylimidazole. For microwave absorption measurement, the as-prepared LDH@ZIF-67 hybrids were mixed with epoxy and then molded into test samples containing 50 wt% of LDH@ZIF-67 hybrids. The maximum reflection loss of 16.3 dB is at a thickness of 2.5 mm. The LDH@ZIF-67 composite with magnetic capacity exhibited well absorption due to increased permeability, which is attributed to ZIF-67; produce higher characteristic of magnetization in LDH@ZIF-67 and the nano-porous structure of ZIF-67. Such excellent electromagnetic wave absorption properties are ascribed to the synergetic effects between the highly porous structure and multiple components, which significantly improved impedance matching.

Biography

Szu-Chen Wu has pursued his BS in Chemical Engineering and MS degree in Department of Chemical and Materials Engineering, Chung Cheng Institute of Technology, Nation Defense University. He is currently a Doctoral student and joined functional photoelectric and nano-biomaterials research lab at NCTU. His current research interest is microwave absorption material.

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