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

Szu-Chen Wu[1], Po-Hsueh Chang[2], Cheng-Hsiung Peng[2], and San-Yuan Chen[1]

[1] Department of Materials Science and Engineering, National Chiao Tung University, 1001 University Road, Hsinchu, Taiwan 300, ROC
[2] Department of Chemical and Materials Engineering, Ming Hsin University of Science and Technology, Hsin-Feng, Hsinchu, Taiwan 304, ROC

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 = 10.5° is matched with the plane of ZIF-67 (002) at 2θ = 10.4° 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 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-ChenWu received the B.S. in chemical engineering and the M.S. degree in Department of Chemical and Materials Engineering, Chung Cheng Institute of Technology, Nation Defense University, in 2011 and 2014, respectively. 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.

Presenting author details
Full name: Szu-ChenWu
Contact number: +886-3-571-2121 ex. 55356
Session name/ number:
Category: Poster presentation