Ag-assisted construction of multiple interfaces in $Ti_3C_2T_x$/g-C_3N_4@Ag composite films for enhanced electromagnetic interference shielding

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The proliferation of electronic devices leads to the generation of significant amounts of electromagnetic radiation, resulting in various detrimental effects, such as temporary device disturbances, environmental pollution, and even potential risks to human health [1]. MXene-based heterogeneous structures with multiple interfaces have inspired significant interest due to their remarkable performance when applied in smart electronic and energy storage devices [2]. Herein, two-dimensional (2D) $Ti_3C_2T_x$/g-C_3N_4@Ag composite films were assembled in a layered structure with multiple interfaces and simultaneously displayed outstanding electromagnetic interference (EMI) shielding effectiveness and distinguished pseudocapacitive performance. Beneficial from the heterogeneous structure, Ag-assisted construction of multiple interfaces, and controllable composition, the composite film containing 10 wt.% of g-C_3N_4@Ag nanosheets exhibited exceptional EMI shielding effectiveness of 51.4 dB and high absolute shielding effectiveness of 25855 dB cm^2 g^{-1}. The high EMI shielding effectiveness largely depends on the enhanced absorption of electromagnetic waves, stemming from local dipolar polarization, the porous architecture, and multiple interface interactions in the composite film.

References

[1] T. Wang, W.-C. Yu, C.-G. Zhou, W.-J. Sun, Y.-P. Zhang, L.-C. Jia, J.-F. Gao, K. Dai, D.-X. Yan, Z.-M. Li, Self-healing and flexible carbon nanotube/polyurethane composite for efficient electromagnetic interference shielding, Composites Part B: Engineering 193 (2020) 108015.
[2] B. Zhou, G. Han, Z. Zhang, Z. Li, Y. Feng, J. Ma, C. Liu, C. Shen, Aramid nanofiber-derived carbon aerogel film with skin-core structure for high electromagnetic interference shielding and solar-thermal conversion, Carbon 184 (2021) 562-570.

Figures

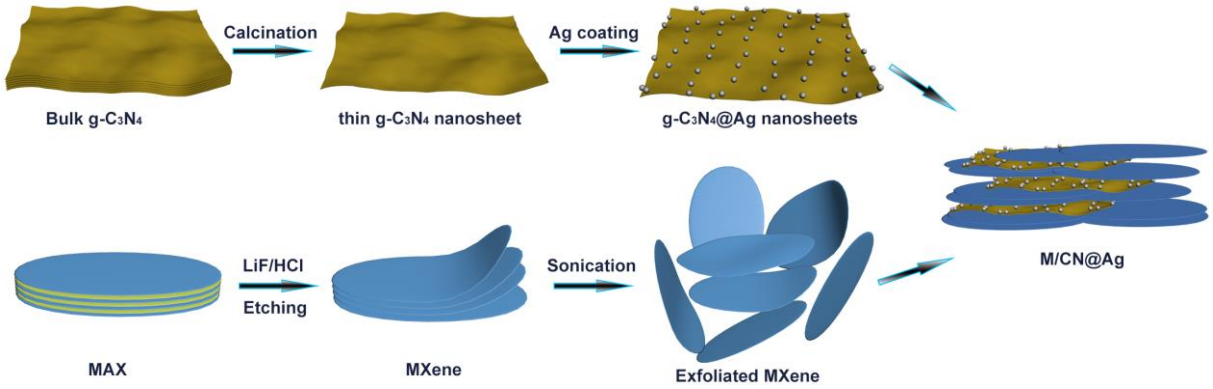

Figure 1: Schematic diagram of the synthesis of $Ti_3C_2T_x$/g-C_3N_4@Ag composite film.