Development of Copper Coated Melamine Foam for Electromagnetic Interference Shielding

Jittipat Omsinsombon[1, *], Amorn Chaiyasat[2], Preeyaporn Chaiyasat[3], Shi Hu[4], Mohanapriya Venkataraman[5], and Jiri Militky[6]

[1] *Department of Chemistry, Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi, Pathum Thani, 12110, Thailand, e-mail: Jittipat_o@mail.rmutt.ac.th*
[2] *Department of Chemistry, Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi, Pathum Thani, 12110, Thailand, e-mail: a_chaiyasat@mail.rmutt.ac.th*
[3] *Department of Chemistry, Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi, Pathum Thani, 12110, Thailand, e-mail: p_chaiyasat@mail.rmutt.ac.th*
[4] *Department of Material Engineering, Faculty of Textile Engineering, Technical University of Liberec, Studentska 1402/2, Liberec, Czech Republic, e-mail: shi.hu@tul.cz*
[5] *Department of Material Engineering, Faculty of Textile Engineering, Technical University of Liberec, Studentska 1402/2, Liberec, Czech Republic, e-mail: mohanapriya.venkataraman@tul.cz*
[6] *Department of Material Engineering, Faculty of Textile Engineering, Technical University of Liberec, Studentska 1402/2, Liberec, Czech Republic, e-mail: Jiri.Militky@tul.cz*

Abstract: This research studied the electromagnetic shielding efficiency of copper nanoparticles (CuNPs) coated on three-dimensional melamine foam (MF). The MF derivatives have fire-retardant properties due to their release of nitrogen gas when burned or charred and are highly flexible and sound absorbable. Therefore, it is suitable for coating various materials and co-developing with CuNPs. The MF was coated with CuNPs by the electroless plating method, which evaluated the results from the EMI shielding. The results of the research found that CuNPs were deposited and distributed throughout the MF, causing the melamine foam coated with CuNPs to have the property of shielding against electromagnetic waves. The electromagnetic shielding (SE) increased with the higher CuNPs content, from 0 to 80%, respectively. According to the study, the porosity decreased from 99 to 73.88% and the electrical conductivity increased from 0.19 to 357 S/m, respectively. These results indicate that the prepared Cu-coated MF has high EMI shielding and conductivity properties. They would be a good novel candidate for building walls or clothes.

Keywords: *Copper nanoparticles, Melamine foam, Electromagnetic interference.*

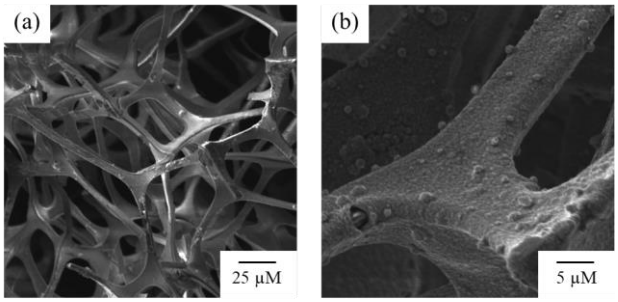

Figure 1 SEM micrograph of MF (a) and Cu-coated MF (b)

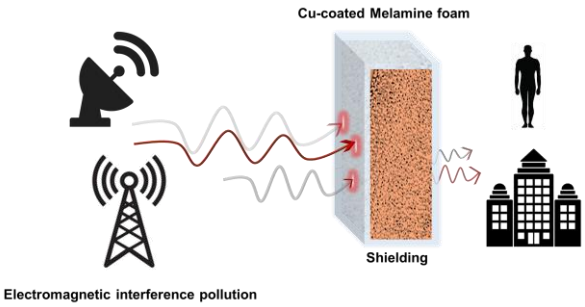

Figure 2 Schematic diagram for EMI shielding

ACKNOWLEDGEMENT*: This project is funded by National Research Council of Thailand (NRCT): N41A650093*

REFERENCES

[1] S. Hu, D. Wang, Y. Kyosev, D. Kremenakova, and J. Militky, "The novel approach of EMI shielding simulation for metal coated nonwoven textiles with optimized textile module," Polymer Testing, vol. 114, p. 107706, 2022/10/01/ 2022.

[2] S. Upadhyay, A. Upadhya, W. Salehi, and G. Gupta, "The medical aspects of EMI effect on patients implanted with pacemakers," Materials Today: Proceedings, vol. 45, pp. 5243-5248, 2021/01/01/ 2021.

[3] S. Hu, D. Wang, A. P. Periyasamy, D. Kremenakova, J. Militky, and M. Tunak, "Ultrathin Multilayer Textile Structure with Enhanced EMI Shielding and Air-Permeable Properties," (in eng), Polymers (Basel), vol. 13, no. 23, Nov 29 2021.