

## Phosphorous-jointed epoxidized soybean oil and rice husk-based silica as the novel additives for improvement mechanical and flame retardant of epoxy resin

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### Abstract

The combined effects of phosphorous-jointed epoxidized soybean oil (DOPO-J-ESO) and rice husk-based silica (RH-SiO<sub>2</sub>) on the flammability and mechanical properties of epoxy resin were examined in detail. The chemical structures of the ESO, DOPO-J-ESO, RH-SiO<sub>2</sub> were confirmed using Fourier transform infrared spectroscopy and proton nuclear magnetic resonance. Many characteristics of the obtained composite materials were examined, such as the tensile properties, impact strength, flexural strength, critical stress intensity factor (KIC), dynamic mechanical analysis, and flammability. The incorporation of both 10 phr DOPO-J-ESO and 20 phr RH-SiO<sub>2</sub> into the epoxy resin yielded the optimum values of the flexural strength, tensile strength, impact strength, and KIC, with increases of 87.78%, 67.23%, 109.34%, and 111.32%, respectively, compared with pristine samples. The limiting oxygen index increased from 23.1% to 29.3%, the peak heat-release rate decreased by up to 37.2%, and the sample satisfied the UL94 V-0 rating.



### Biography:

Cuong Manh Vu has completed his PhD at the age of 28 years from Hanoi University of Science and Technology (Vietnam). He is the lecturer at Le Qui Don Technical University. He has published more than 30 ISI papers relating to polymer science in peer reviewed journal.

### Speaker Publications:

1. Nguyen DD, Vu CM, Vu HT, Choi HJ. Micron-Size White Bamboo Fibril-Based Silane Cellulose Aerogel: Fabrication and Oil Absorbent Characteristics. *Materials* (Basel). 2019;12(9):1407. Published 2019 Apr 30. doi:10.3390/ma12091407.
2. Nguyen VH, Vu CM, Choi HJ, Kien BX. Nanosilica Extracted from Hexafluorosilicic Acid of Waste Fertilizer as Reinforcement Material for Natural Rubber: Preparation and Mechanical Characteristics. *Materials*

(Basel). 2019;12(17):2707. Published 2019 Aug 23. doi:10.3390/ma12172707.

3. Cuong Manh Vu, Quang-Vu Bach. (2020) Effects of DOPO-Grafted Epoxidized Soybean Oil on Fracture Toughness and Flame Retardant of Epoxy Resin/Rice Husk Silica Hybrid. *Macromolecular Research* 28:9, pages 826-834
4. Vu, C.M., Choi, H.J. Fracture toughness and surface morphology of micro/nano sized fibrils-modified epoxy resin. *Polym. Sci. Ser. A* 58, 464-470 (2016). <https://doi.org/10.1134/S0965545X16030196>.



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