



Self-assembly strategy to obtain phytic acid doped OBN hybrids for enhancing fire safety of epoxy resin

Tingting Feng, Chuanmei Jiao*, Xilei Chen*

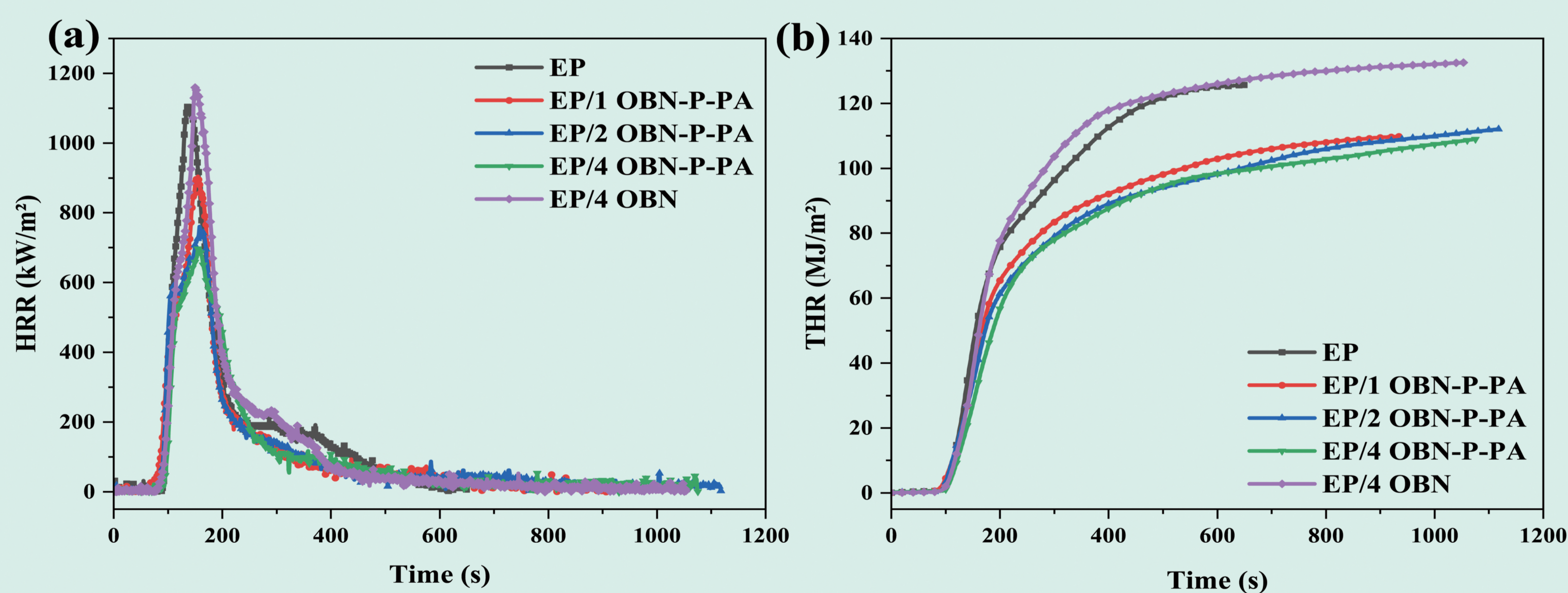
College of Environment and Safety Engineering,
Qingdao University of Science and Technology, Qingdao, Shandong 266042, P R China

ABSTRACT

Phytic acid (PA) doped BN layered structure was constructed by self-assembly strategy based on the principle of electrostatic interaction. Polyethyleneimine (PEI) was used as the linker between BN and PA. Through thermogravimetric analysis (TGA) of pure EP and its composites in N_2 atmosphere, it was concluded that OBN-P-PA hybrids promoted the carbonization of EP and thus improved its thermal stability. In addition, when 4 wt% OBN-P-PA hybrids were added to EP, the pHRR, smoke factor (SF) and peak carbon monoxide production rate (pCOPR) decreased by 40.1%, 45.3% and 39.7%, respectively, compared to pure EP, accompanied by an increase in glass transition temperature (T_g) and flexural modulus.

Flame retardancy

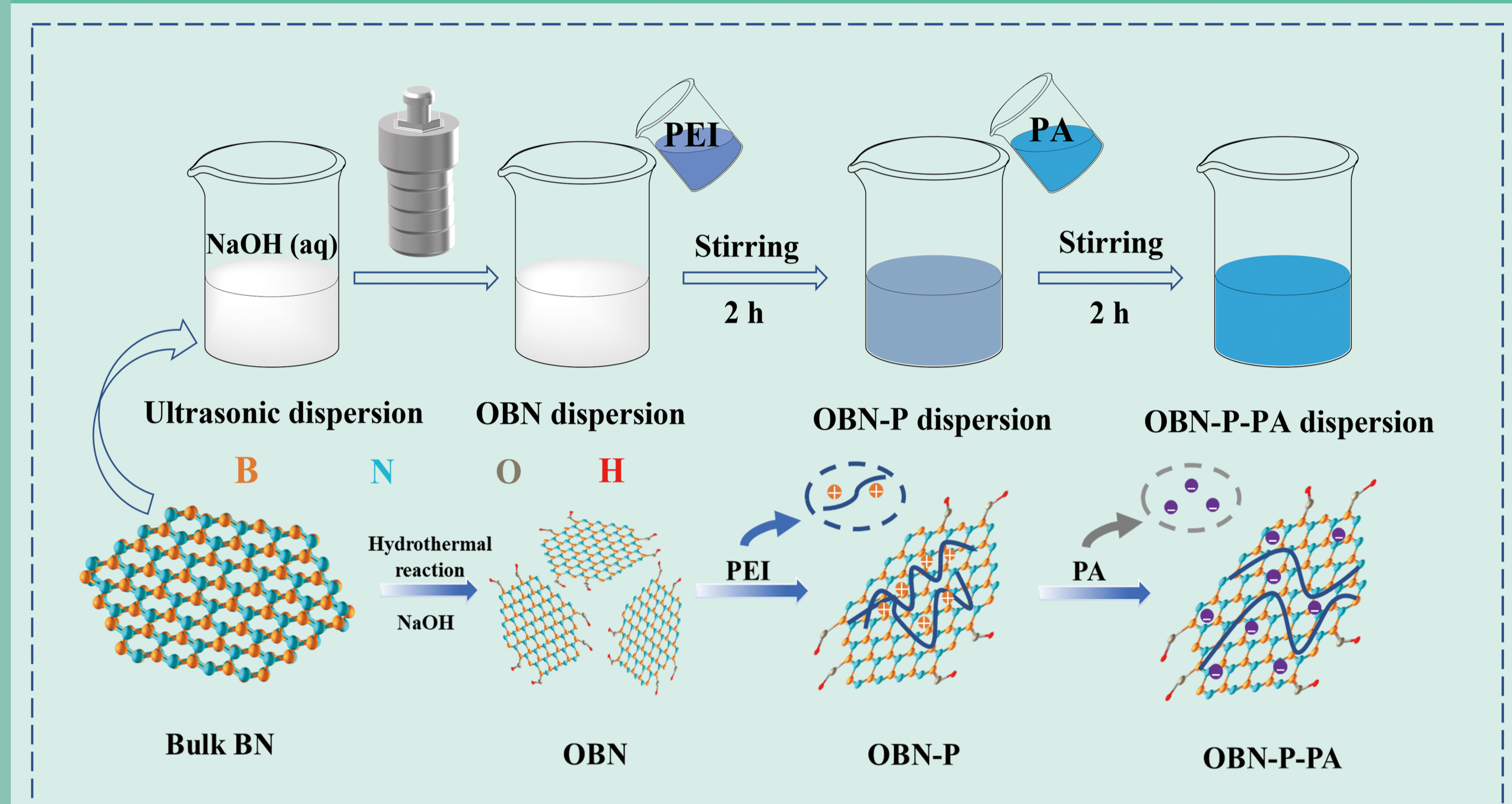
With the increasing addition amount of OBN-P-PA hybrids, the value of the pHRR of EP composites decreases continuously. After the 4 wt% OBN-P-PA is introduced into EP, the value of pHRR of the EP composite is reduced to 696.848 kW/m^2 , which is 40.07% lower than that of EP/OBN composites under the same dosage. A similar trend is also found in the THR of EP and its composites. Therefore, it can be concluded that OBN-P-PA shows higher flame retardant efficiency than OBN in EP.



Conclusions

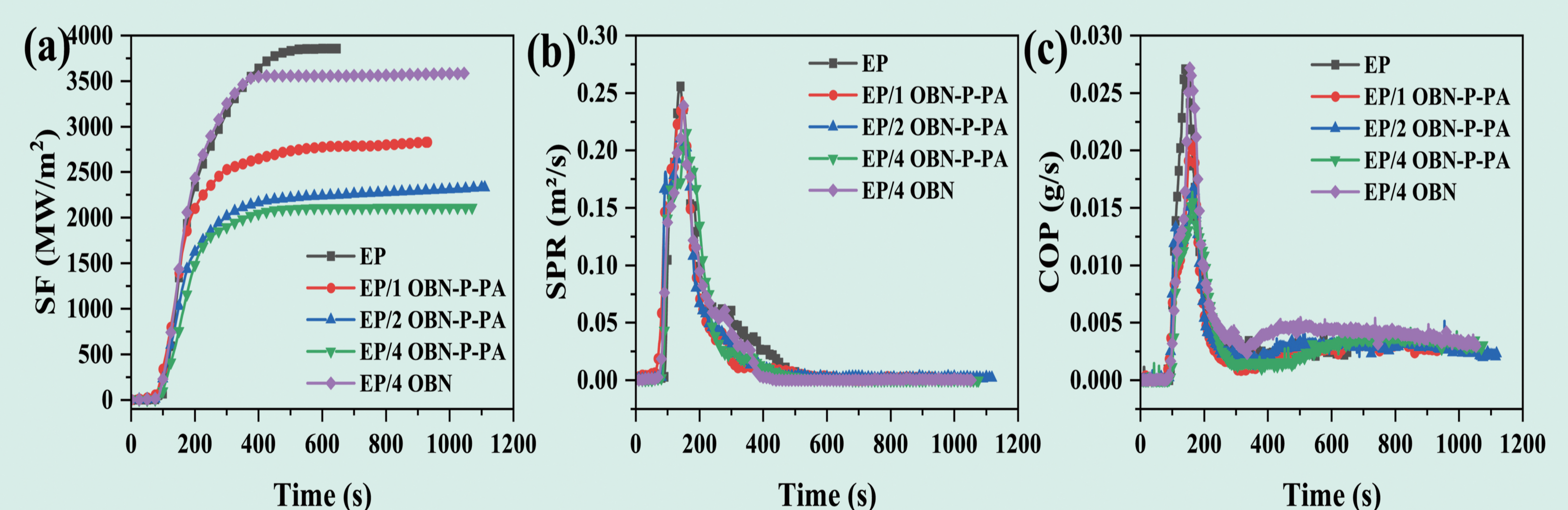
In this paper, composites with obvious flame-retardant based on EP and OBN-P-PA are constructed. The preparation of the OBN-P-PA hybrid is based on the electrostatic interaction principle, and PA is successfully uniformly doped on the surface of OBN. Due to the superior catalytic carbonization ability and physical barrier effect of OBN-P-PA, the improvement of fire safety performance of EP/4 OBN-P-PA composite is well reflected in flame retardant and smoke suppression.

Preparation of OBN-P-PA



Smoke suppression

The SF of neat EP can reach 3841.9 MW/m^2 . Compared with that, the SF of EP composites decreases with varying degrees. Among them, with the increase of the proportion of OBN-P-PA hybrid in EP, the SF value of EP/OBN-P-PA composite gradually decreases. The SF value of EP/4 OBN-P-PA composite decreases by 45.3% compared with that of EP/4 OBN composite at the same additional amount of filler. The results show that introducing the OBN-P-PA hybrid in EP can improve fire safety more efficiently than OBN.



Flame retardant mechanism

