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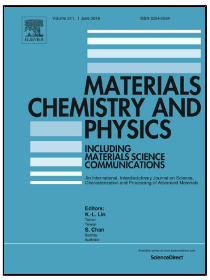

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PII:	S0254-0584(18)30334-1
DOI:	10.1016/j.matchemphys.2018.04.065
Reference:	MAC 20560
To appear in:	*Materials Chemistry and Physics*
Received Date:	22 July 2017
Revised Date:	16 March 2018
Accepted Date:	21 April 2018

Please cite this article as: Zhenzhong Sun, Yanbei Hou, Yuan Hu, Weizhao Hu, Effect of additive phosphorus-nitrogen containing flame retardant on char formation and flame retardancy of epoxy resin, *Materials Chemistry and Physics* (2018), doi: 10.1016/j.matchemphys.2018.04.065

Effect of additive phosphorus-nitrogen containing flame retardant on char formation and flame retardancy of epoxy resin

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Abstract: A novel polymeric flame retardant poly(pentaerythritol phosphate phosphinic acyl piperazine) (PPAP) was synthesized successfully. The structure was confirmed by Fourier transform infrared spectra (FT-IR) and nuclear magnetic resonance spectra (NMR). The flame retardant property was characterized by limited oxygen index (LOI) and cone calorimetry test. Compared with 19% of epoxy resin, the LOI value of epoxy resin/PPAP composites (EP/PPAP) could reach high up to 35% when PPAP content was 20wt % (EP-4) and the photographs of char residues demonstrated excellent char-forming ability of PPAP. The increasing char residues in thermogravimetric analysis (TGA) and analyses of real time FT-IR (RT-FTIR) showed improved thermal stabilities of EP/PPAP composites. The formation of enhanced stable char layer were proved by FT-IR, scanning electron microscopy (SEM) and Raman spectroscopy. The dynamic mechanical properties of EP/PPAP composites such as storage modulus and crosslinking density were substantially