Accepted Manuscript

Sub-atmospheric bursting ignition of fluorinated ethylene propylene wire insulation

Jun Fang, Siwei Zhao, Jingwu Wang, Yan Xue, Xuanze He, Yongming Zhang

PII:	S0379-7112(18)30128-0
DOI:	10.1016/j.firesaf.2018.07.005
Reference:	FISJ 2725
To appear in:	*Fire Safety Journal*
Received Date:	21 March 2018
Accepted Date:	03 July 2018

Please cite this article as: Jun Fang, Siwei Zhao, Jingwu Wang, Yan Xue, Xuanze He, Yongming Zhang, Sub-atmospheric bursting ignition of fluorinated ethylene propylene wire insulation, *Fire Safety Journal* (2018), doi: 10.1016/j.firesaf.2018.07.005

Sub-atmospheric bursting ignition of fluorinated ethylene propylene wire insulation

Jun Fang, Siwei Zhao, Jingwu Wang*, Yan Xue, Xuanze He, Yongming Zhang

State Key Laboratory of Fire Science, University of Science and Technology of China, Hefei, Anhui, 230026, P. R. China

* Corresponding Author:

Jingwu Wang (Ph.D)

State Key Laboratory of Fire Science, University of Science and Technology of China, Hefei, Anhui 230026, P. R. China

Tel.: +86-551-6360-1651

Fax: +86-551-6360-1669

Email: wjw1997@ustc.edu.cn

Abstract

Fire-resistant materials, such as fluorinated ethylene propylene (FEP), are used to coat wires in spacecraft. However, their bursting ignition has not been investigated sufficiently. In this study, the pilot ignition of the FEP wire insulation was assessed in a sub-atmospheric pressure test chamber while applying constant high current. The results revealed that the FEP insulation induced bubble formation as pyrolysis gases accumulated gradually between the wire core and the insulation. The bubble burst when the inner pressure exceeded the surface tension of the insulation and was accompanied by the release of a volatile gas jet, which mixed with air and was ignited by the red-hot metal core. The expansion stress was higher toward the wire center, so bursting was more probable at the center. The ignition delay consisted of the bubble bursting time, mixing time and chemical reaction time, with a significant proportion occupied by the bursting time. Moreover, the ignition delay decreased with pressure and oxygen concentration. Although the mixing time increased with pressure, the Damköhler number was proportional to the square