VIDEO ARTICLE

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Thermal Endurance of Swelling Anti-Fire Composites Equipped with Rfid Technology

Kamil Janeczek[1,*], Mateusz Kosyl[2], Aneta Araźna[1], Michał Czaiński[2], Wojciech Stęplewski[1], Marek Kościelski[1], Krzysztof Lipiec[1]

[1]Łukasiewicz Research Network – Tele and Radio Research Institute, Warsaw, 03-450, Poland
[2]Intuseal Sp. z o.o., Piaseczno, 05-500, Poland

*Corresponding author: E-mail: kamil.janeczek@itr.lukasiewicz.gov.pl

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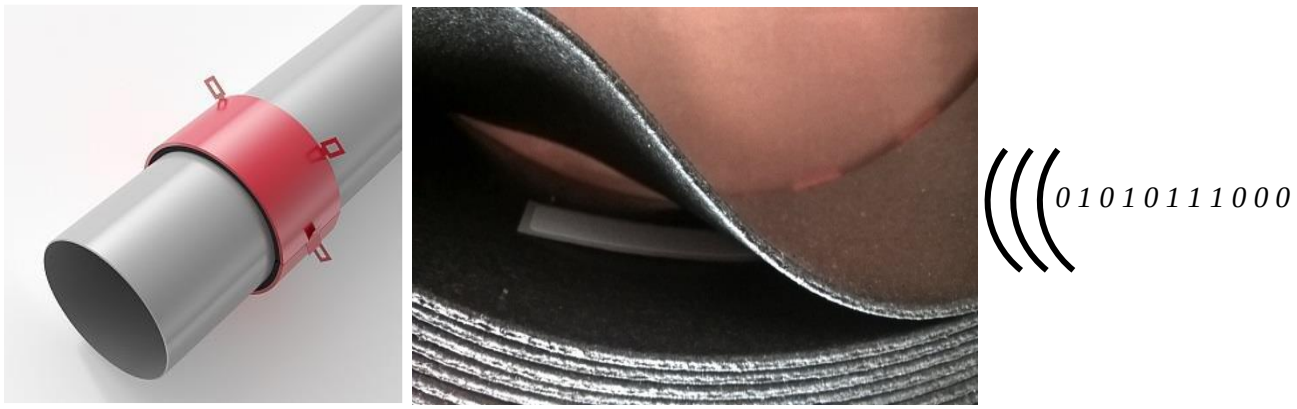
Graphical Abstract



Abstract

Passive fire protection is one of the key safety systems which is installed in modern buildings. Its aims are to eliminate or minimize negative influence of expanding fire, spreading smoke and high temperature on people and building itself. To enhance effectiveness of the mentioned fire protection measures it is crucial to use appropriate swelling composites. These composite materials should allow to prevent against fire and smoke spreading for a period of time dependent on a selected fire resistance class. In this paper, such prepared swelling materials used e.g., in intumescent pipe wrap, fire rate intumescent coat, intumescent grille, are presented. The second issue addressed is an identification method of these fire protection after their installation in buildings. In order to verify its presence it is often required to demolish some parts of buildings and after inspection rebuilding. Therefore, it is beneficial to identify them wirelessly with using Radio Frequency Identification (RFID) technique bearing that in mind that selected RFID tags have to exhibit sufficient thermal endurance. The results achieved in this study showed that the designed swelling materials behaved as expected and fulfilled the whole protected space when exposed to high temperature. There were observed small differences in temperature distribution across the tested passive protections. The applied RFID tags showed to be

capable to identify the fire protections as well as to withstand high temperature, in particular when a gasket sealant or a high-temperature silicone were utilized for their encapsulation. It was possible to establish communication even after several minutes after their placement in high temperature. The critical temperature revealed to be about 120°C, but applying higher temperature did not cause total damage of the tags, even in a long term. After a subsequent cooling process of the RFID tags installed into passive fire protections data exchange between reader and tags was restored.

Keywords: Passive fire protection, swelling composites, RFID, pipe collar, intumescent grille.

Acknowledgements

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References

1. M. Ahrens, High-Rise Building Fires, *NFPA Research*, **2016**, 1-39.
2. X. Li, Z. Zhao, Y. Wang, H. Yan, X. Zhang, B. Xu, *Chemical Engineering Journal*, **2017**, *324/15*, 237-250.
3. D.-M. Wang, J.-G. Hu, J. Wu, *IEEE Transactions on Industrial Electronics*, **2019**, *66/3*, 2164-2173.
4. C. Zhang, Y. Xie, *IEEE Internet of Things Journal*, **2018**, *5/5*, 3927-3941.
5. P. S. Nimlyat, A. U. Audu, E. O. Ola-Adisa, D. Gwatau, *Sustainable Cities and Society*, **2017**, *35*, 774-785.

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