

2nd International Conference on Structural Integrity, ICSI 2017, 4-7 September 2017, Funchal, Madeira, Portugal

## Heat resistance research and surface analysis of fireproof textiles with titanium silicide coating

Ewelina Małek<sup>a\*</sup>, Danuta Miedzińska<sup>a</sup>, Michał Stankiewicz<sup>a</sup>

<sup>a</sup>Military University of Technology, Faculty of Mechanical Engineering, Kaliskiego 2 St, 00-908, Warsaw, Poland

### Abstract

The aim of presented work was to study two types of special fireproof textiles covered with titanium silicide coating (Fig.1). In the paper the assessment of the change in heat resistance properties and analysis structure of TiSi coated fireproof textile were carried out. The aim of the research was to study the influence of TiSi coating on the infrared radiation (thermal) resistance generated in specially designed testing stage. The radiation intensity was registered with the use of thermovision camera. The research results showed the influence of the applied coating on the heat resistance properties of the textiles.

Presented research is a part of a project the aim of which is to develop a technology for manufacturing the textiles used to produce the protective clothing for emergency services and military, as well as other coated materials for a wide range of applications. The new material should be characterized with increased heat resistance coupled with protection against gas pressure impact caused e.g. by gas installation damage.

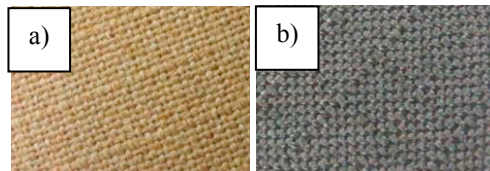


Fig. 1 - Example of analyzed textile a) without TiSi coating, b) with TiSi coating

© 2017 The Authors. Published by Elsevier B.V.  
Peer-review under responsibility of the Scientific Committee of ICSI 2017

**Keywords:** fireproof textiles; thermal resistance; surface layer

\* Corresponding author. Tel.: +48 261 837 867;  
E-mail address: [ewelina.malek@wat.edu.pl](mailto:ewelina.malek@wat.edu.pl)

## 1. Introduction

### 1.1. Personal protective equipment

Personal protective equipment (PPE) refers to protective clothing, helmets, goggles, or other garments or equipment designed to protect the wearer's body from injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Protective equipment may be worn for job-related occupational safety and health purposes, as well as for sports and other recreational activities. "Protective clothing" is applied to traditional categories of clothing, and "protective gear" applies to items such as pads, guards, shields, or masks, and others.

The purpose of personal protective equipment is to reduce employee exposure to hazards when engineering controls and administrative controls are not feasible or effective to reduce these risks to acceptable levels. PPE is needed when there are hazards present. PPE has the serious limitation that it does not eliminate the hazard at source and may result in employees being exposed to the hazard if the equipment fails (Oudejans et al. 2016).

Personal protective equipment can be categorized by the area of the body protected, by the types of hazard, and by the type of garment or accessory. A single item, for example boots, may provide multiple forms of protection: a steel toe cap and steel insoles for protection of the feet from crushing or puncture injuries, impervious rubber and lining for protection from water and chemicals, high reflectivity and heat resistance for protection from radiant heat, and high electrical resistivity for protection from electric shock (Verbeek et al. 2016).

At the European Union level, personal protective equipment is governed by Directive 89/686/EEC on personal protective equipment (PPE). The Directive is designed to ensure that PPE meets common quality and safety standards by setting out basic safety requirements for personal protective equipment, as well as conditions for its placement on the market and free movement within the EU single market. It covers 'any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards (Article 1, Directive 89/686/EEC on personal protective equipment, 1989).

The directive was adopted on 21 January 1989 and came into force on 1 July 1992. The European Commission additionally allowed for a transition period until 30 June 1995 to give companies sufficient time to adapt to the legislation. After this date, all PPE placed on the market in EU Member States was required to comply with the requirements of Directive 89/686/EEC and carry the CE Marking.

Article 1 of Directive 89/686/EEC defines personal protective equipment as any device or appliance designed to be worn or held by an individual for protection against one or more health and safety hazards. PPE which falls under the scope of the Directive is divided into three categories:

- Category I: simple design (e.g. gardening gloves, footwear, ski goggles)
- Category II: PPE not falling into category I or III (e.g. personal flotation devices, dry and wet suits)
- Category III: complex design (e.g. respiratory equipment, harnesses).

### 1.2. Required features of special clothes

Special clothing used by firefighters is a personal protective equipment applied during fighting the fire. This is a technically complicated product, whose task is to protect the firefighter against extreme threats occurring during rescue operations. Special clothing must provide effective protection against (Jaworski 2011):

- heat radiation and flame,
- molten metal particles,
- penetration of liquid chemicals,
- mineral oils,
- moisture from rain or fire extinguishing water,
- mechanical factors.

Download English Version:

<https://daneshyari.com/en/article/5452649>

Download Persian Version:

<https://daneshyari.com/article/5452649>

[Daneshyari.com](https://daneshyari.com)