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DIGEST

Flame Retardant Coating of Linen Fabrics

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Summary

In this research we have investigated the effect of antimony trioxide (Sb_2O_3), with commercial printing pasta Printperfec EX-TS and Tubvinyl 235MC, as well as with pigment Bezaprint ROT KF) as a flame-retardant printing onto raw linen fabric and bleached linen fabric. After printing, half of fabrics were washed for 5 cycles. Burning tests of raw linen fabric and printed with commercial printing pasta and antimony trioxide were accomplished. The results of the test showed that unprinted raw and bleached linen cloth burns fully. Flame retardant properties were observed for all printed fabrics including printed and subsequently washed fabrics.

Introduction

Flax is one of the oldest crops grown in Latvia. It is a dual-purpose crop grown for both fibres and seeds. Flax industry is very important for the development of the Latvian economy, because flax fibres have a very broad range of application [1]. After almost total abandonment during the previous decades, flax fibres are now being re-evaluated by the fashion industry. They are increasingly appreciated by consumers due to such features as freshness, comfort and elegance of linen clothing [2] and home textiles. Reduced flammability of different textiles is also required by legislation in many countries nowadays. This is because of deaths caused by ignition and subsequent burning of flammable garments [3]. The chemicals which were represented at the time to assure fire resistance or slow process of burning of materials were rare and needed special methods of usage. With the development of chemical industry in the area, the methods of usage with time are becoming easier, but the standards and regulations of fire safety have evolved and their implementation has become compulsory in most industries [4]. The most important commercial compound as synergist with flame retardant chemicals is antimony trioxide commonly known as ATO, which is used in a wide variety of industrial applications. 24250 tons of antimony trioxide is used per year, including 1750 tons/ year as a textile flame retardant [5].

Materials and methods

The plain woven 100% raw linen fabric with surface density of 162.8 g/m^2 and bleached linen fabric with surface density of 167.7 g/m^2 (both produced by the Company Larelini Ltd in Latvia) were used for printing.

Before printing, the fabrics were pre-washed in the distilled water with washing agent Felosan NOF (2 g/l) from CHT R Beitlich GMBH for one hour and subsequently rinsed in cold /warm water.

Commercial printing pastes Tubiscreen EX-TS and Tubvinyl 235 MC (CHT/Bezema AG) and pigment Bezaprint ROT KF (CHT R Beitlich GMBH) with additive Sb_2O_3 (20g /1000g) were applied for printing. Drying at 100°C for 7±1 min and thermal treating at 150°C for 5 min was used.

For half of the printed fabrics 5 cycles of washing, according to ISO 105-C10:2006 standard was used.

Testing of flame retardance of pre-washed raw and bleached linen fabrics and printed fabric as well as fabric washed after printing was carried out according to LVS EN ISO 15025:2003 standards.

Conclusion

The raw and bleached linen fabrics were prepared and printed with commercial printing pastas Printperfec EX-TS and Tubvinyl 235 MC, and antimony trioxide as flame-retardant.

The right side of the printed fabrics was coated with continuous coating, which is the preferred option.

Protective coating reduces fabric reaction to fire and contributes to flame extinction forming char residue.

Pre-washed raw and bleached linen fabric burned completely in the test for flame retardance.

The best flame-retardant properties were observed from the right side of the printed fabrics.

Small decrease of flame-retardant properties was observed for some of the printed and subsequently washed fabrics.

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