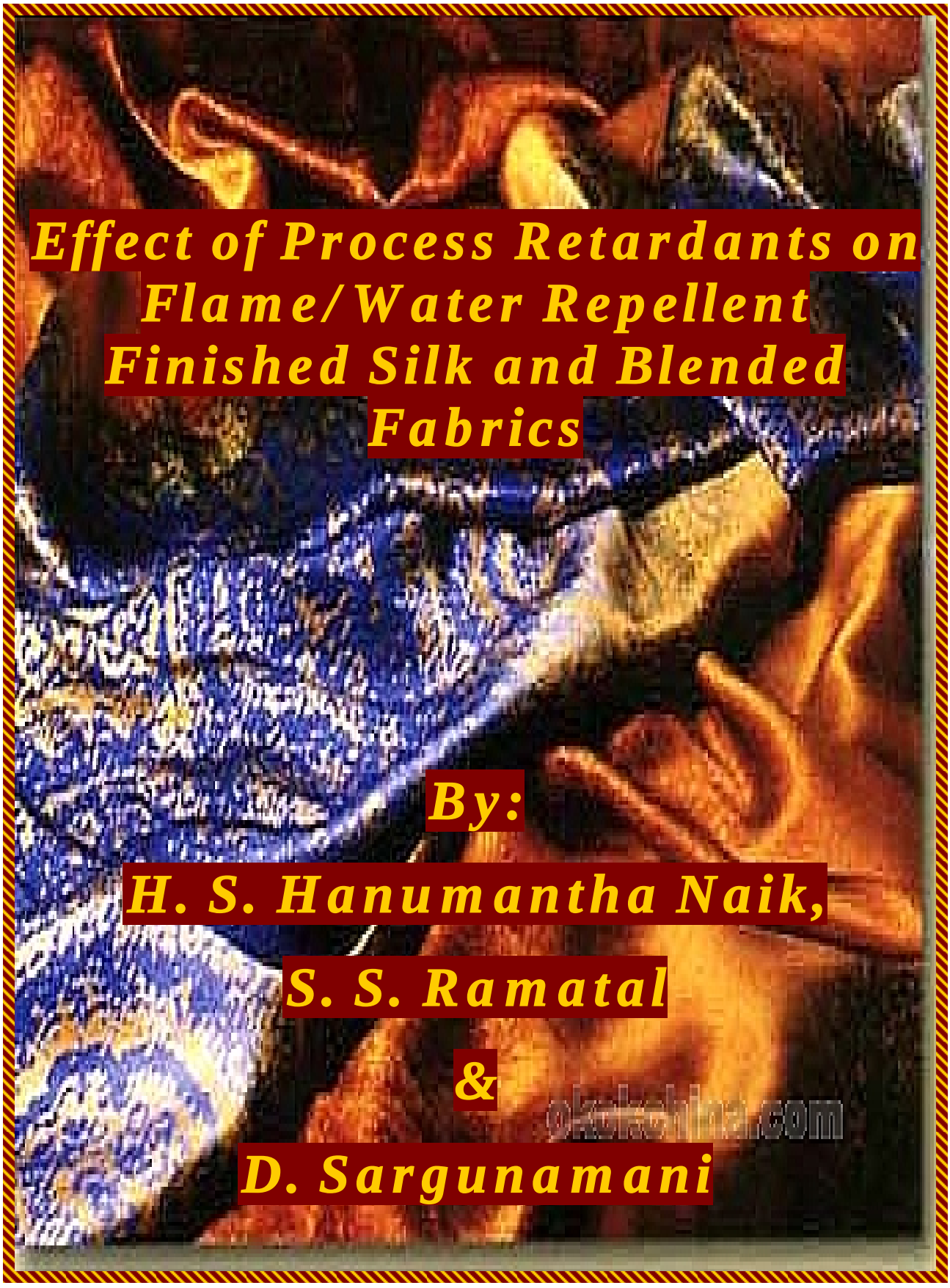

# Effect of Process Retardants on Flame/Water Repellent Finished Silk and Blended Fabrics

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**Abstract**

Finishes are used on textile materials for various purposes, specifically considering some finishes to impart special properties to the fabric for specific end uses e.g., flame and water repellent fabrics. Various parameters used during the process have effect on performance properties of the finish used. Therefore, keeping this in view, an attempt has been made to study performance of repellent silk fabrics using commercial retardants used for flame/water on silk and silk/cotton blended fabrics. Results showed that variation in rating in the case of WR and same class for FR in the acceptable range.

## Introduction

Silk is a luxurious protein fibre, which is beautiful, soft, smooth in hand (cultivated silk), this silk can be dyed, printed and finished as per customer requirements.

Finishing refers to completing the manufacture of cloth by surface treatment, specifically confined to final stage of embellishment after dyeing and printing. Finishing may take many forms, since it depends on the type of material used and intended use. Focusing on flame retardant (FR) finish fabric, it does not propagate the flame. Water repellent (WR) finishes are used in fabrics to resist wetting and these are relatively porous. Sometimes combined oil/water repellent finishes are used. Method of application of finishes on fabric, substrate, type of retardant used has effect on result of the finished fabric. Therefore, keeping this in view, a study has been made using commercial retardants as finish to look effect on performance parameters on different types of Silk and Silk/Cotton

blended fabrics. FR and WR finishes were applied on fabrics using commercial methods in an Industry located at Bengaluru, Karnataka. Results are expressed in terms of Rating/Class.

**Materials and Methods**

Three fabric samples used in FR finish has the following particulars:

| Particulars | Warp | | | | Weft | | | |
|---|---|---|---|---|---|---|---|---|
| | S.no.1 | S.no.2 | S.no.3 | S.no.4 | S.no.1 | S.no.2 | S.no.3 | S.no.4 |
| **Yarn** | Silk | Silk | Silk | Silk | Silk | Dupion Silk | Cotton | Cotton |
| **Count** | 20/22 denier–2ply | 20/22 denier–4ply | 20/22 denier–2ply | 20/22 denier–2ply | 24 denier-12 ply | 500 denier | 2/40's Ne - 12 ply | 2/40's Ne -12 ply |
| **Yarns/inch** | 120 | 100 | 112 | 101 | 100 | 84 | 100 | 90 |
| **Fab.wt ($g/m^2$)** | 198 | 123 | 185 | 121 | - | - | - | - |

Sample no. 1 to 3 are used for FR treatment and Sample no. 2 is replaced with sample no. 4 for WR treatment. Flame retardant commercially available ADDIFLAM R.SP 31 (75% pick up 300 g/l), containing blend of phosphorous and nitrogen colorless liquid suitable for natural fibres was used. Padding at room temperature method was followed. Drying was at 100 – 130 ºC for - 1 to 2 min. Unidyne TG – 571 an eco friendly water and oil repellent – emulsion/off white, readily soluble in water was used in the study to carry out WR treatment. 50 g/l of Unidyne TG – 571 was used in silk and 80 g/l on cotton. Pad dry cure method with application conditions of 1 dip 1 nip at 70 % wet pick up – 120 ºC drying 3 min followed by 160 ºC curing for 2 min and then treated at 180 ºC for 60 sec. WR test was done following standard spray test rating.

**Results and Discussion**

Table 1 shows the effect of flame retardant on different kind of samples. It can be observed that all three samples showed DNI, ie., based on ASTM methodology data collection one of the ways is if the fabric does not ignite (DNI), no time is recorded.

**Table 1: Effect of flame retardant on performance parameter**

| Sample No. | Burn. time in Sec. (45 ° test) | Class |
|---|---|---|
| 1 | DNI | I |
| 2 | DNI | I |
| 3 | DNI | I |

Further, from the table 1 it can be observed that all the fabrics show Class I, which is AFMA proposed fabric classification indicating that more specimens are DNI, then the fabric is considered Class I fabric. It means that retardant used yields better results. For analyzing and differentiating the above 3 samples, since they showed Class I fabrics, Another test was done by subjecting samples to flame 5 to 20 min. Weight reduction of these samples showed sample no variation for 5 min. but after 5 min. variation of sample containing cotton/silk was more compared to other two samples since, it may be because of cotton is present in the sample. This clearly indicates that though all samples are Class I fabrics, if sample contains silk yarn which are flame retardant treated are better than cotton treated.

Table 2 shows the effect of water repellent on performance parameter of different kind of samples.

**Table 2 : Effect of water repellent on performance parameter**

| Sample No. | Rating | Evaluation |
|---|---|---|
| 1 | 100 | No sticking/ Wetting of upper surface |
| 2 | 90 | Slight random sticking/ Wetting of upper surface |
| 3 | 100 | No sticking/ Wetting of upper surface |

It can be observed from the table 2 that all the samples which are WR treated show better results. Sample No.4 contains blended yarns cotton and silk compared to samples No.1 and 3 containing silk only. Though, blended the samples show comparable results and slight reduction in rating may be different fabric construction particulars such as thread density, count as chemical properties of fibres as well as repellent hold on blended sample on surface may be lower.

**Conclusion**

The above study clearly indicates that though different kinds of yarns are used in FR fabrics, rating is similar because of the method used and type of retardant showing better performance and similarly WR treated also showed better rating of all samples except little lower in sample containing blended yarn of silk/cotton which may be due to various physical, chemical properties as well as cloth construction parameters.

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