FRPM 11

13th European Meeting
on Fire Retardant Polymers
26-30 JUNE 2011
ALESSANDRIA - ITALY

PROGRAMME

INVITED LECTURE
PLENARY LECTURE

LUNCH
COFFEE BREAK

POSTER
SESSION

Sunday, 26 June 2011

17.00/19.00 REGISTRATION
19.00 WELCOME RECEPTION

Politecnico di Torino
Sede di Alessandria
Viale Teresa Michel, 5
Alessandria

HOUR	27/06/2011		28/06/2011		29/06/2011		30/06/2011
8.00/9.00	registration						
9.00/9.20	Intro	9.00/9.20	De Boysère	9.00/9.20	Puser	9.00/9.20	Didane
9.20/9.50	Schartel	9.20/9.40	Bonnet	9.20/9.40	Stec	9.20/9.40	Zhang
9.50/10.20	Wilkie	9.40/10.00	Despinasse	9.40/10.00	Tange	9.40/10.00	Ceylan
10.20/10.40	Coffee break	10.00/10.30	Bourbigot	10.00/10.30	Beyer	10.00/10.20	Alongi
10.40/11.00	Kandola	10.30/10.50	Coffee break	10.30/10.50	Coffee break	10.20/10.40	Coffee break
11.00/11.20	Coletti	10.50/11.20	Doring	10.50/11.20	Torero	10.40/11.10	Horrocks
11.20/11.40	Fontaine	11.20/11.40	Goebelbecker	12.10/11.40	Krämer	11.10/11.30	Duquense
11.40/12.00	Liu	11.40/12.00	Nakashima	11.40/12.00	Brizzi	11.30/11.50	Lorenzetti
12.00/12.20	Fina	12.00/12.20	Rakotomalala	12.00/12.20	Spogli	11.50/12.10	Friederich
12.20/12.40	Chen	12.20/12.40	King	12.20/12.40	Troitzsch	12.10/12.30	Wladyka-Przybylak
12.40/13.00	Ton-That	12.40/14.10	Lunch	12.40/14.10	Lunch	12.30/12.50	Wang
13.00/14.30	Lunch	14.10/14.40	Hu			12.50/13.00	Closing remarks
14.30/15.00	Wang	14.40/15.00	Howell	15.30/20.00	Social afternoon	13.00	Lunch
15.00/15.20	König	15.00/15.20	Pospiech				
15.20/15.40	Köppl	15.20/15.40	Rerat				
15.40/16.00	Coffee break	15.40/16.00	Okamoto				
16.00/16.30	Hull	16.00/18.00	Coffee				
16.30/16.50	Gaan		POSTER				
16.50/17.10	Ferry						
17.10/17.30	Szolnoki						
		19.00/20.00	Classical music concert	20.00/23.00	Social dinner		

INVITED SPEAKERS
FUNDAMENTAL ASPECTS IN FIRE BEHAVIOUR AND FIRE RETARDANCY
FIRE RETARDANCY OF POLYMERS
NEW MATERIALS/FIRE PROTECTIVE MATERIALS
ENVIRONMENTAL ASPECTS
INDUSTRIAL APPLICATIONS
FIRE RETARDANCY OF FIBRES AND TEXTILES
NANOSCIENCE AND SYNERGY

CONE CALORIMETRY AS A USEFUL TECHNIQUE FOR THE SCREENING OF COTTON FIBERS

Ö. Ceylan[1*], Lieve Van Landuyt[1], J. Alongi[2], A. Frache[2], K. De Cleck[1]

[1]Ghent University, Department of Textiles, Technologiepark 907, B-9052 Zwijnaarde, Ghent, Belgium – ozgur.ceylan@ugent.be, lieve.vanlanduyt@ugent.be karen.declerck@ugent.be
[2] Polytechnic of Turin, Alessandria site, Italy – jenny.alongi@polito.it; alberto.frache@polito.it

Abstract – Cotton biotechnology offers the potential for breakthrough developments in fiber characteristics. In this process, the early selection of fibers with the best performance is of utmost importance. However, due to the limited availability of these specialty fibers, the use of available test methods is limited and thus new test methodologies are needed. The aim of this paper is to study Cone calorimetry for the characterization of cotton fibers. One of the main aspects of the procedure, namely sample weight, is optimized to improve the reproducibility.

Text

Introduction

Cotton is the most important natural fiber used in textile industry. Despite increasing competition from synthetic fibers, cotton has maintained its importance and utility up till now thanks to its superior fiber characteristics. However innovations in textile and clothing industry increased the demand of better fiber quality to produce cotton end products that exhibit improved functional characteristics such as easy care or flame retardancy.

Flame retardant cotton products are commonly produced by incorporating flame retardant chemicals or fibers. Alternatively, naturally flame-retardant cotton fiber has been described [1] or advances in biotechnology might eventually create new opportunities for novel cotton fibers with improved thermal properties [2]. An important obstacle to the further success of this approach has been the proper selection of novel fiber types with the best performance using small amounts of fiber. Current test methods, especially in the field of flame retardancy testing, require large quantities of materials, moreover mostly in a fabric form. Therefore novel instrumentations and test methodologies that use only a few grams of fiber are needed [3].

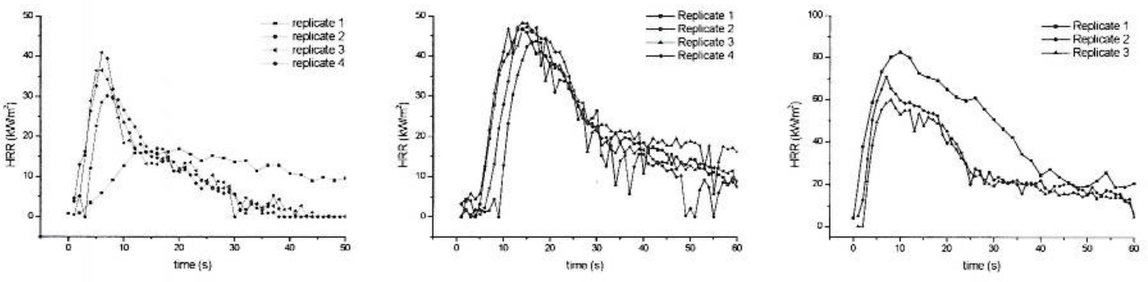
In this perspective, Cone calorimetry turns out to be a helpful instrumentation to measure the combustion behavior of cotton fibers. It is a relatively new, small-scale method that utilizes oxygen consumption principle and provides results with high accuracy in good agreement with large scale fire tests. For fabrics, the methodology has been optimized[4], [5] however, up to the authors knowledge, fibrous samples have never been studied. In the scope of this paper, an important parameter that can affect the measurements namely sample weight is extensively studied.

Materials and Methods

Raw cotton fibers (Micronaire: 4.0-4.5, length: 28-29 mm, strength:28-30 cN/tex) from Utexbel (Ronse, Belgium) were used in this study. A cone calorimeter made by Fire Testing Technology Limited model FFT was used for the testing of the samples.

Results and Discussion

For textile fabrics, especially for light weight samples, the thickness of the mono-layer specimen is about 0.5 mm and thus it remains lower than the sample-cone heater distance even if more layers are under study. On the other hand, for the fibers, the thickness depends on the amount of sample. Therefore the effect of sample weight has been investigated for three different weights while the rest of process parameters were kept constant. The thickness measured for 1, 2 or 3g of cotton fibers are 8, 12 and 16 mm, respectively. The individual heat release rate (HRR) data curves for each sample weight are shown in Figure 1.



(a) (b)

(c)

Figure 1 HRR curves of cotton fibers obtained for 1 g (a), 2 g (b) and 3 g (c) sample weights

The most reproducible data were obtained when the sample weight was 2 g. For 1g specimen, the weight is too low and even if the curves have the same profile, they are not overlapped. In addition, one of these repetitions resulted in the pyrolysis of the fibers instead of their combustion. For the 3g specimen, the curves are shifted on the HRR axis. The difference of their peaks is around $12kW/m^2$ and thus these data cannot be estimated as reproducible. In this operative conditions, the problem is probably due to the volume of the sample at the fixed distance between specimen-cone heater.

Conclusions

Present work proves that fibrous samples can be tested using Cone calorimeter. An important aspect of the procedure namely sample weight has been thoroughly investigated. It was clear that sample weight influence has a significant influence on reproducibility of the measurements. The best reproducibility was obtained when 2 g sample weight was used for the experiments.

References

[1] S. V. Fox, US Patents, 5,496,623, 1996.

[2] M. John and G. Keller, in Proceedings of the National Academy of Sciences of the United States of America, 93, 23, 12768-12773, 1996.

[3] M. E. John, "Cotton crop improvement through genetic engineering," Critical Reviews in Biotechnology, 1997 l. 17, 185

[4] J. Tata, J. Alongi, F. Carosio, and A. Frache, Fire and Materials, 2010, in press.

[5] S. Nazaré, B. Kandola, and A. R. Horrocks, Fire and Materials, 2002, 26, 191-199