

Poster Presentations — B24

Surgical Drape Combustion in $FIO_2=0.21$, $FIO_2=0.50$ and $FIO_2=0.95$

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Introduction: Operating Rooms and Intensive Care Units are hazardous areas for nosocomial fires. This is due to the presence of oxygen-enriched atmospheres, thermal and electrical ignition sources and fuels such as surgical drapes. In the United States, operating room fires are reported 100-200 times per year. Since the most common fuel in an operating room fire is the surgical drape, we studied the combustion characteristics of surgical drapes in air and oxygen-enriched atmospheres.

Methods: Five drape materials were tested in three oxygen concentrations. A carbon dioxide laser emitting 15 watts was used for ignition. In a test box a sample holder supported the sample at 45°, and the laser beam impinged the sample at 90°. Measured values are: Time to Ignition = seconds from actuation of laser to ignition of sample, and Burnout Time = seconds from ignition to total fuel consumption. For samples that exhibited no ignition, flammability by secondary ignition was determined using filter paper above or below the sample.

Results:

TIME TO IGNITION (Seconds)

	OXYGEN					
	21%		50%		95%	
	# Ignited	Mean∇SD	# Ignited	Mean∇SD	#Ignited	Mean∇SD
Cellulose / Polyester	10 / 10	2.7 ∇ 2.2	10 / 10	0.1 ∇ 0.0	10 / 10	0.1 ∇ 0.0
Cotton / Polyester	10 / 10	4.0 ∇ 0.9	10 / 10	1.1 ∇ 0.3	10 / 10	0.65 ∇ 0.2
Huck Towel	8 / 10	11.9 ∇ 5.0	10 / 10	2.3 ∇ 1.0	10 / 10	1.8 ∇ 0.3
Polypropylene	0 / 10	NI	9 / 20	0.1 ∇ 0.1	11 / 20	0.2 ∇ 0.2
Phenol Polymer	0 / 10	NI	10 / 10	4.9 ∇ 0.9	10 / 10	2.5 ∇ 0.7
NI = no ignition			0.1 = instantaneous			

BURNOUT TIME (Seconds) 0.1=instantaneous NI= no ignition

	OXYGEN (FIO_2)					
	0.21		0.50		0.95	
	# Ignited	Mean∇SD	# Ignited	Mean∇SD	#Ignited	Mean∇SD
Cellulose / Polyester	10/10	9.4(∇2.6)	10/10	4.6(∇0.7)	10/10	4.1(∇1.2)
Cotton / Polyester	10/10	31.4(∇4.7)	10/10	12.1(∇5.7)	10/10	9.6(∇ 0.80)
Huck Towel	8/10	34.8(∇3.3)	10/10	18.5(∇1.3)	10/10	9.8(∇0.4)
Polypropylene	0/10	NI	9/20	8.3(∇2.7)	11/20	7.4(∇4.3)
Phenol Polymer	0/10	NI	10/10	163.3(∇7.5)	10/10	71.4 (∇4.2)

Secondary ignition in air of polypropylene with filter paper below specimen revealed perforation of polypropylene, ignition of filter paper and combustion of the combination. Time to Ignition = 4.7 mean and Burnout Time = 27.1 mean. Secondary ignition in air of phenol polymer with filter paper above specimen revealed ignition of filter paper with no ignition of phenol polymer. With filter paper below the specimen, there was no ignition of the specimen or the filter paper.

Conclusion: With increasing oxygen concentration, all measured parameters become more severe. When secondary ignition results are included, ranking in order of increasing combustion safety is cellulose/polyester, polypropylene, cotton/polyester, Huck towel, phenol polymer.