

Chemicals of Concern in Children's products

A Case Study on Children's Car Seats



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HEALTHY STUFF

Researching toxic chemicals in everyday products

Research and Policy Projects

Toys & Other Children's Products

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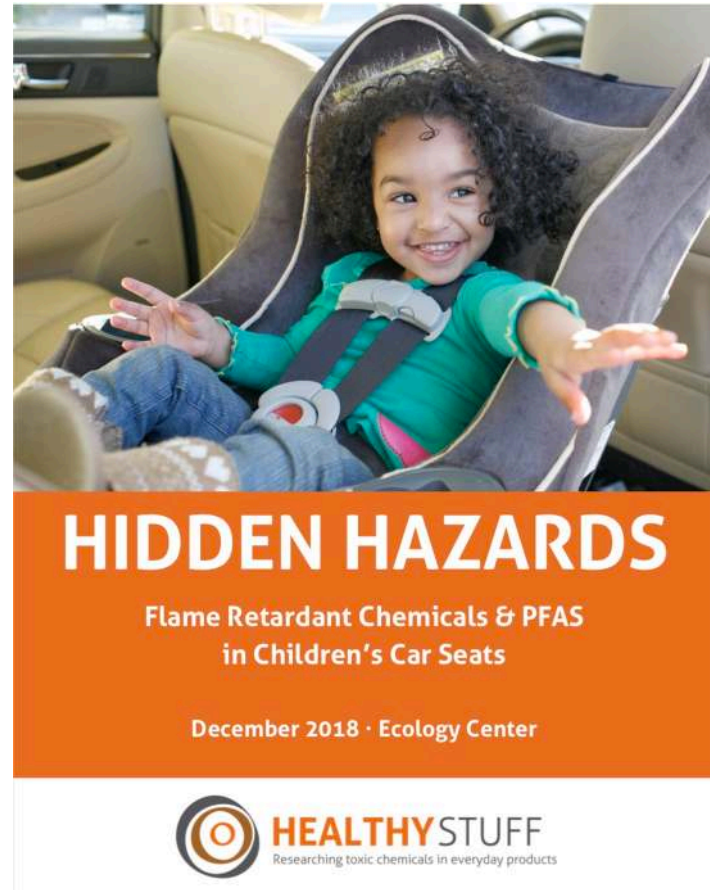
Food

Food Packaging

Food Processing Equipment

Mattresses

Screening Studies



12 years of children's car seat studies

Year of study	Number of seats tested	What we tested for	Analytical methods
2006	131	<ul style="list-style-type: none"> • Bromine • Chlorine • Heavy metals 	XRF
2008	59		
2011	153		
2013	18		
2014	15	<ul style="list-style-type: none"> • Multiple specific flame retardants • Heavy metals • Bromine • Chlorine • Phosphorus 	XRF GC/MS LC/MS FTIR (starting in 2016)
2016	15		
2018	17		

Case Study:

Britax, a popular car seat company, worked with Healthy Stuff to develop a strong chemicals policy and to remove halogenated FRs from all their car seats.



britax

2008 & 2011

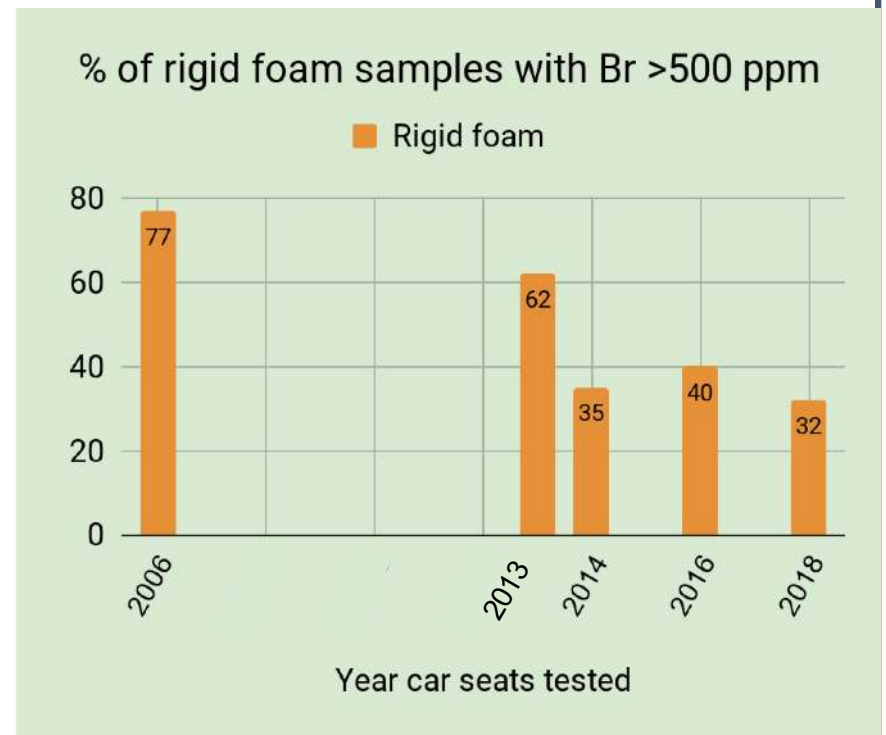
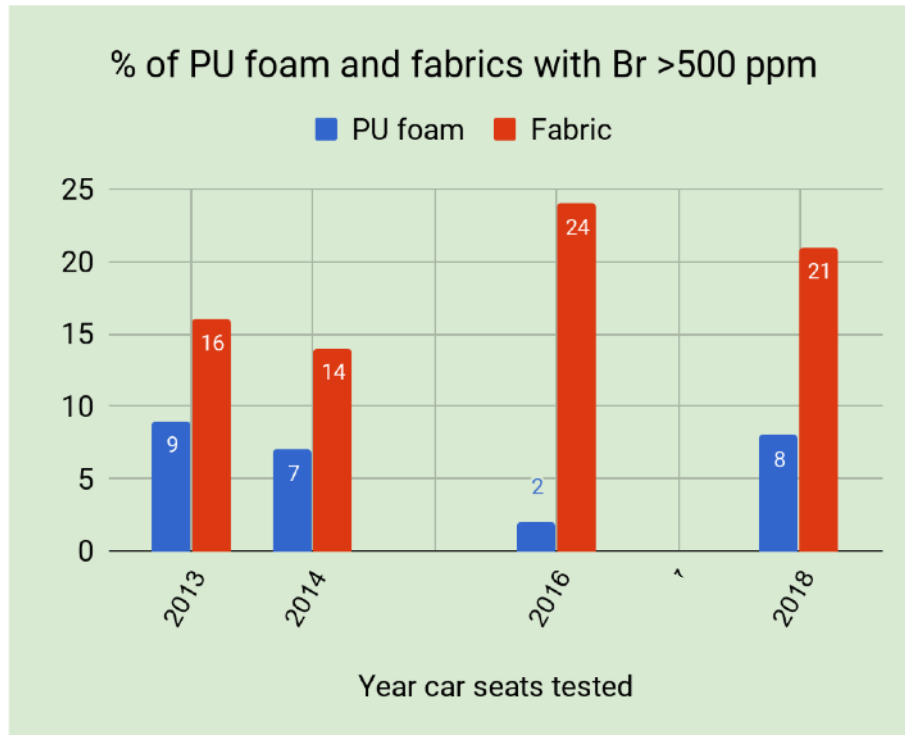
Bromine
Chlorine
Lead

2014 & 2016

None

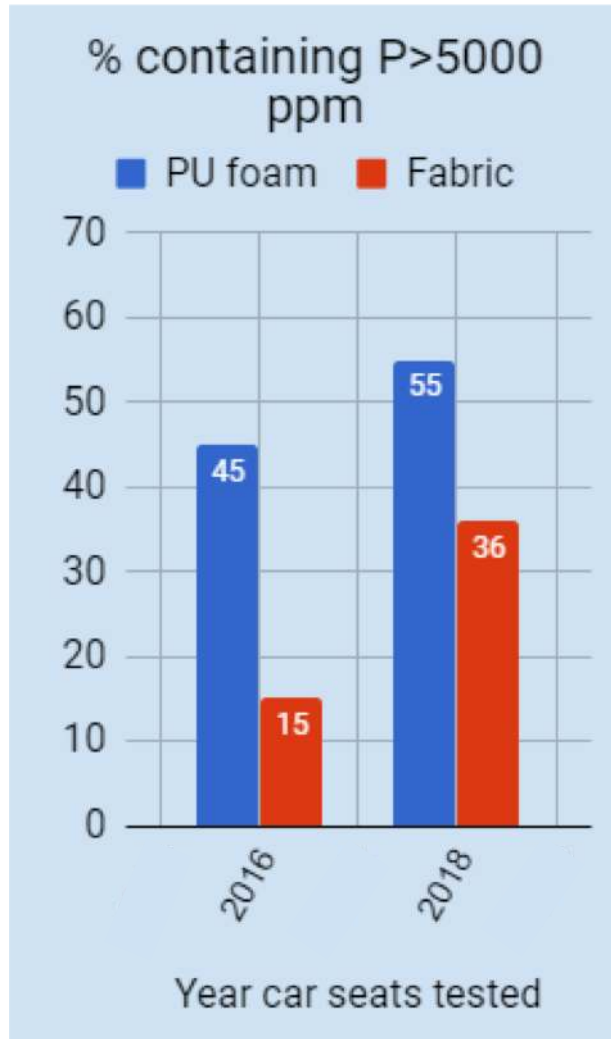


Changes in BFR usage over time



- BFRs appear to have increased in fabric since 2013.
- BFRs detected in PU foam and fabrics 2014 and 2016 include: tris(2,3-dibromopropyl)isocyanurate, brominated polystyrenes, and others unidentified.
- BFRs (identified as HBCD in 2014 and 2016) are still used in rigid foam but have become less common since 2006. In part this reflects increasing use of expanded polypropylene (EPP) in place of expanded polystyrene (EPS)--see next panel.

Increase in phosphorus-based FR usage



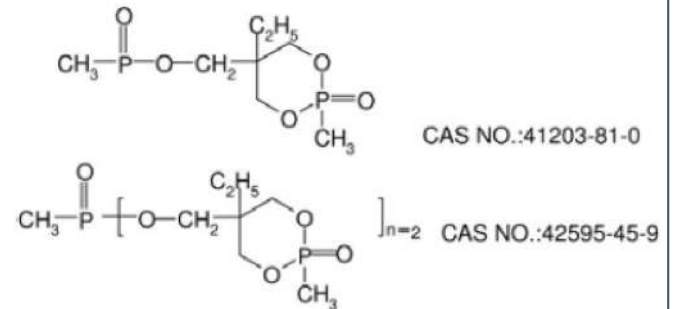
P-containing FRs detected in 2016 and 2018

- Triethyl phosphate
- Tri(butoxyethyl)phosphate
- Triphenyl phosphates
- Cyclic phosphonate esters (Amgard CU, Amgard 1045)
- Ammonium polyphosphate

Other

- Melamine

*Cyclic phosphonate ester (Amgard CU, Amgard 1045)
Formerly called AntiBlaze 19 or 1045*



Study Design

- Tested 18 seats
- All seats purchased in 2018
 - All seats manufactured in 2017 or 2018
- 12 brands tested: Baby Trend, Britax, Chicco, Clek, Cosco, Eddie Bauer, Evenflo, Graco, Maxi-Cosi, Nuna, Safety 1st and UPPAbaby
- Dorel owns 3 brands: Cosco, Maxi-Cosi, Safety 1st. Eddie Bauer no longer made.
- Tested 2 seats each from 6 brands: Britax, Clek, Evenflo, Graco, Nuna, UPPAbaby

Study Design

For each seat, we tested between 9 and 31 components

Test methods included

- In House: XRF and FTIR
- 3rd Party Labs
 - Indiana University-Marta Venier (tested for FRs): Gas chromatography and liquid chromatography coupled to mass spectrometry (GC/MS and LC/MS)
 - University of Notre Dame-Graham Peaslee (PFAS): Particle-Induced Gamma Ray Emission (PIGE) spectroscopy

Highlights from the 2018 study

- Newly launched FR-free seats
- Most child car seats still contain hazardous flame retardants: 83% (15 of 18) of seats studied still contain FRs that may be hazardous.
- Toxic PBDEs and chlorinated tris are out
- 50% of seats contained PFAS
- ***Design changes can eliminate both added FRs & PFAS***
- The federal government must change FR regulations

3 categories: Low Concern,
 Moderate Concern
 High Concern

descriptive ranking scheme

Flame retardant (FR) profile:

1 - No halogens, no detected FR.

2- Contains phosphorus-based FRs. Contains up to one major component with bromine.

3 - Contains phosphorus-based FRs. Contains bromine in at least two major components.

One seat (Eddie Bauer) also contains PVC.



LOW CONCERN

- Clek Fflo - Convertible - Mammoth
- Nuna Pipa Lite - Infant - Fog
- UPPAbaby MESA - Infant - Jordan

MODERATE CONCERN

- Britax Advocate Clicktight - Convertible - Circa
- F** Britax Roundabout - Convertible - Charcoal Black
- F** Clek Foonf - Convertible - Thunder
- Cosco Scenera NEXT - Convertible - Moon Mist Grey
- F** Maxi-Cosi Mico 30 - Infant - Bright Rose
- Safety 1st Grow & Go 3-in-1 - Convertible - Shadow
- UPPAbaby MESA - Infant - Taylor

HIGH CONCERN

- F** Baby Trend EZ Flex-Loc - Infant - Morning Mist
- F** Chicco KeyFit 30 - Infant - Regatta
- Eddie Bauer XRS 65 - Convertible - Viewpoint
- F** Evenflo Nurture - Infant - Max
- F** Evenflo SureRide DLX - Convertible - Paxton
- Graco Contender 65 - Convertible - Piedmont
- F** Graco Snugride Click Connect 30 - Infant - Kyte
- F** Nuna Pipa - Infant - Graphite

Level of concern was evaluated by assessing the presence and hazard of flame retardants in seats. Ratings are based on the exact model and fabric color tested.

- F** Contains fluorinated substances

View complete 2018 Children's Car Seat Report at healthystuff.org

Seat name	PFAS on fabric*	Results Summary
Clek floo with Mammoth wool fabric	No	No bromine; no FR detected. Fabric is wool.
Nuna Pipa Lite - Fog	No	No bromine; no FR detected. Fabric is polyester.
UPPAbaby Mesa Infant Car Seat - Jordan	No	No bromine; no FR detected. Seat fabric is wool-polyester; canopy is polyester.
Britax Advocate Clicktight ARB	No	No bromine; fabrics with TBEP, foam with TBEP, TEP
Britax Roundabout - Charcoal Black	Yes	No bromine; some fabric with TBEP, TPHP and RDP.
Clek foanf with Thunder fabric	Yes	No bromine; foam with unidentified phosphorus compound. Fabric is polyester.
UPPAbaby Mesa Infant Car Seat - Taylor	No	No bromine; fabrics with cyclic phosphonate ester and TEP.
Maxi-Cosi Mico 30 - Bright Rose	Yes	1 component with bromine (warning label); fabric with cyclic phosphonate ester
Cosco Scenera Next - Moon Mist Grey	No	1 fabric with bromine; foam with TBEP and TEP.
Safety 1st Grow and Go 3-in-1 - Shadow	No	Upholstery fabric w/bromine. Foams & fabrics with TEP and TBEP.

Chicco KeyFit 30 - Regatta	Yes	4 components with bromine (canopy, seat fabric, warning label). Fabrics & foam with cyclic phosphonate ester & 1-cyanoguanidine.
Eddie Bauer XRS 65 - Viewpoint	No	4 components with bromine (2 foams, a fabric, and interfacing with DBDPE). Foams with TBEP and cyclic phosphonate ester; fabric with cyclic phosphonate ester; PVC fake leather with DOTP.
Evenflo Nurture - Blake	Yes	5 components with bromine (rigid foam, canopy, seat, and interfacing fabrics, one with DBDPE). Fabrics with aryl phosphate mix.
Evenflo Sureride DLX - Paxton	Yes	4 components with bromine (rigid foam, seat, and interfacing fabrics). Fabrics with cyclic phosphonate ester; foams with TBEP and TEP.
Graco Snugride 30 - Kyte Fashion	Yes	2 components with bromine (rigid foam, canopy fabric with DBDPE). Fabrics with cyclic phosphonate ester & 1-cyanoguanidine.
Baby Trend EZ Flex Loc - Morning Mist	Yes	4 components with bromine (rigid foam, canopy and seat fabric, warning label). Fabrics with cyclic phosphonate ester & 1-cyanoguanidine.
Graco Contender 65 - Piedmont Fashion	No	3 components with bromine (rigid foam, fabric, & warning label with DBDPE). Fabrics & foams with cyclic phosphonate ester.
Nuna Pipa- Graphite	Yes	6 components with bromine (rigid foam, PE closed cell foam with DBDPE, PU foam, warning label, fabrics). Fabrics & foam with cyclic phosphonate ester, foam with TBEP.

Children's Car Seats Contain Legacy and Novel Flame Retardants

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Supporting Information

ABSTRACT: Brominated and phosphorus-based flame retardants (PFRs) were measured in foam and fabric samples from 18 newly marketed children's car seats. The concentrations of two cyclic phosphonates {PMMMPs, 5-ethyl-2-methyl-2-oxido-1,3,2-dioxaphosphinan-5-yl)methyl methyl phosphonate and bis[(5-ethyl-2-methyl-1,3,2-dioxaphosphoran-5-yl)methyl] methyl phosphonate *p,p'*-dioxide} were quantitatively measured for the first time in the North American environment and were much higher than those of other flame retardants. Median PMMMP concentrations were 73.6 $\mu\text{g/g}$, accounting on average for 52% of the total FR concentrations, indicating an intentional addition of PMMMPs during the manufacturing process of these car seats. Two other emerging PFRs [tris(2,4-di-*Hi* *Katie*,*t*-butylphenyl) phosphate (TDTBPP) and resorcinol bis(diphenyl phosphate) (RDP)] were detected for the first time in baby products at median levels of 1.11 and 6.15 $\mu\text{g/g}$, respectively. Other frequently detected PFRs included triethyl phosphate (TEP), triphenyl phosphate (TPHP), and tris(2-butoxyethyl) phosphate (TBOEP). Among the brominated flame retardants monitored, decabromodiphenyl ethane (DBDPE), with a median concentration of 128 $\mu\text{g/g}$, was the only halogenated FR measured at levels suggesting intentional use. Other brominated FRs such as hexabromobenzene (HBB) and 2,3-dibromo 2,4,6-tribromophenyl ether (DPTE) were sporadically detected with median concentrations of 0.23 and 0.18 $\mu\text{g/g}$, respectively. Despite being phased out in the United States starting in 2013, polybrominated diphenyl ethers (PBDEs) were still observed in 75% of our samples, although at modest levels (median total PBDE levels of 0.24 $\mu\text{g/g}$). Trace PBDE levels suggest background contamination rather than intentional use. The high levels of FRs measured in these children's car seats together with the negative health effects associated with some of these compounds are a cause for concern for children's health.



Call to Action

- Calling on NHTSA to update their flammability standards
 - exempt car seat from the FMVSS 302 test; or
 - allow them to comply with an alternative standard more appropriate to children's products.
 - Sing-on letter co-signed by 17 organizations, including Sierra Club, US PIRG.
- Ongoing dialogue with national NGO's and NHTSA



Nuna Pipa

Chemically flame retarded
textiles contain TBEP, PMMMP,
DBDPE

\$299.95

<https://www.nuna.eu/pipa>



Nuna Pipa Lite

Flame retardants free
FMVSS 302 compliance achieved through
fabric design

\$349.95

<https://www.nuna.eu/usa/pipa-lite>

Wool & polyester/wool blends

- In comparison with other natural and manmade fibers, wool is an inherently low flammability natural fiber that self-extinguishes when exposed to a flame.
 - High nitrogen (16%) and
 - Sulphur (3-4%) contents
- Results in high ignition temperature (570-600°C), low heat of combustion (27kJ/g) and relatively high loss of ignition (LOI) (25-27%).

Fabric Structure & Flammability

- Fabric weight, air permeability, and cover factor (density of the weave) cause changes in the flame retardancy characteristics of fabrics
- Thread density and weave factor strongly influence fabric's flammability. When the overall density and weave density increase the flammability decreases.

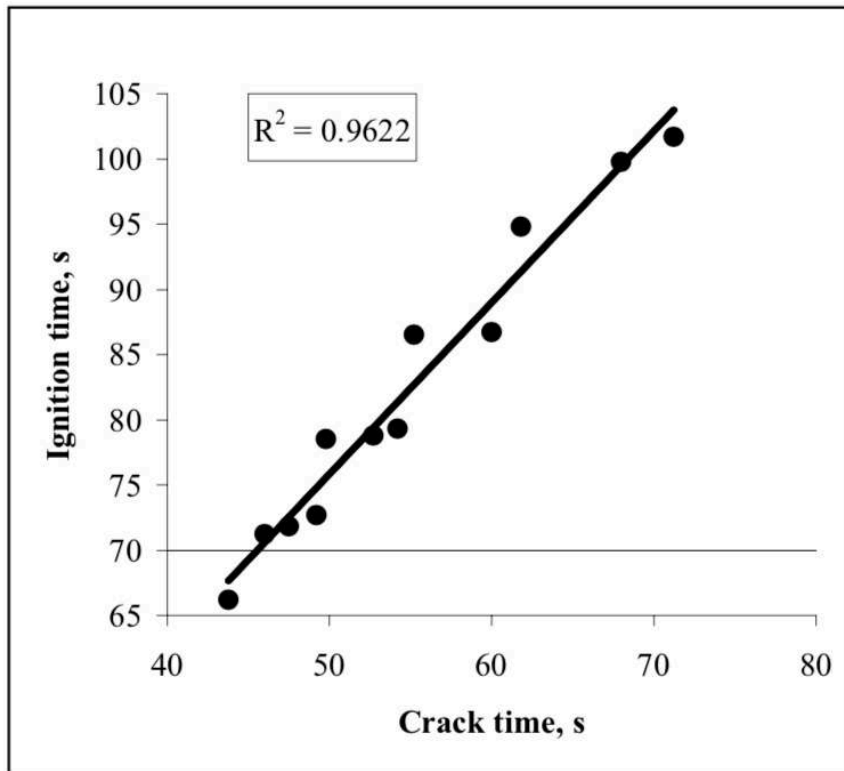


Fig. 3. Correlation between fabric ignition time and its crack time

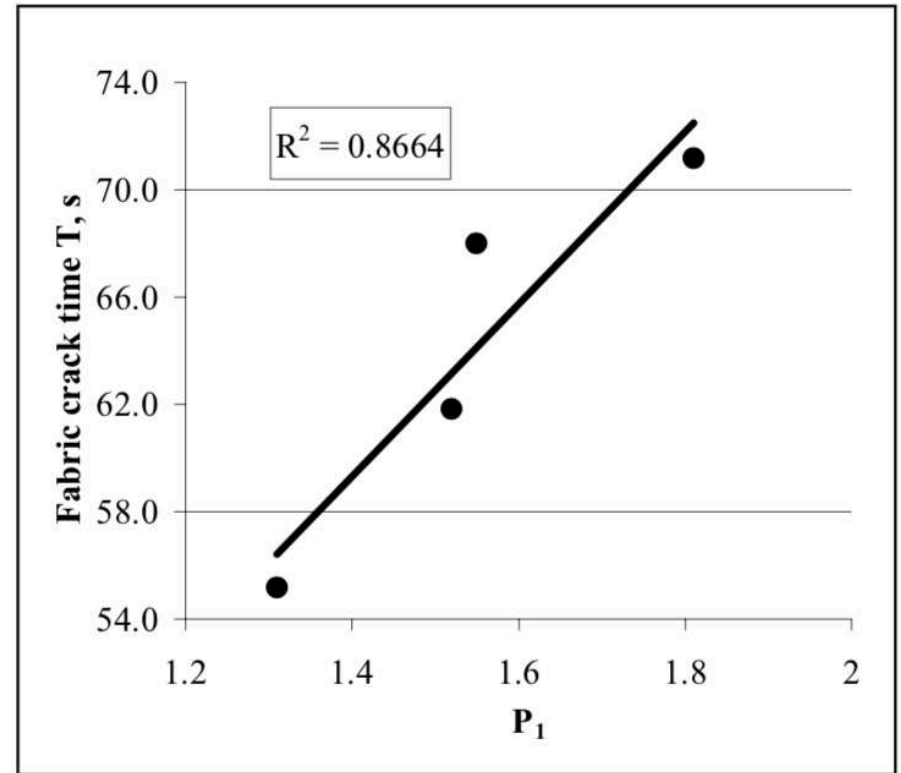


Fig. 5. Dependence of fabric crack time on weave factor

Influence of Woven Fabrics Structure upon Flammability Properties:

https://www.researchgate.net/publication/267817671_Influence_of_Woven_Fabrics_Structure_upon_Flammability_Properties

Acknowledgements

Indiana University: Marta Venier, Kevin Romanak, Yan Wu

Notre Dame: Graham Peaslee

Agilent Technologies: Viorica Lopez-Avila

Ecology Center: Gillian Miller, Lauren Olson

