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Brominated Flame Retardants in New Motor Vehicles: Applications and Trends in Major Automotive Components

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Introduction: Concern about the impact of the use of toxic chemicals, primarily used in plastics, in vehicles continues to grow. As both the number of cars in use and the time people spend in vehicles increases, the impact on the environment and human health from chemicals contained in materials grows. These chemicals have impacts during production, use and final disposal of vehicles. Of particular concern to vehicle purchasers are chemicals contained in materials that they routinely touch or chemicals that are released into the air inside the vehicle causing the “new car smell”.

HealthyCar.org is based on research conducted by the Ecology Center that looks at the presence of key hazardous materials contained in vehicles. The Center tested over 200 2006/2007 model year new vehicles for the elemental composition of 15 different components in the vehicles. The elemental composition of the materials allows the researchers to determine the presence of key toxic chemicals, including Brominated Flame Retardants (BFRs); Polyvinyl Chloride (PVC) and phthalate plasticizers; and a range of heavy metals, such as mercury, lead, chromium, antimony and cadmium. The results of the research will be translated into a HealthyCar.org ranking which will easily allow the public to compare the relative performance of vehicles in each market class. Vehicle ranking will be available through HealthyCar.org, a consumer friendly, interactive web site.

Products and Methodology: HealthyCar.Org will include results from over 200 of the most popular vehicles on the market today. In general, the most common trim line available was sampled. Vehicles were sampled with a portable, hand-held XRF analyzer at auto dealers located in Michigan. In each vehicle, 15 different interior components were sampled, including: steering wheel, shift knob, arm rest/center console, instrument panel, headliner, carpet, seat front, seat back, seat base, hard door trim, soft door trim, sealer, wiring, window seal and wheel weights. (*See attached vehicle fact sheets for sample locations*) XRF sample time was 30 seconds per sample.

X-Ray Fluorescence (XRF) Spectrometry: Although more popularly known for its diagnostic use in the medical field, the use of x-rays forms the basis of many other powerful measurement techniques, including X-ray Fluorescence (XRF) Spectrometry. XRF Spectrometry is used to identify elements in a substance and quantify the amount of those elements present to ultimately determine the elemental composition of a material. Hand-held, portable XRFs are now commonly used in many industrial settings to verify material quality and assure adherence to composition specifications. For more information on the XRF used in this research or on X-Ray Spectroscopy in general see <http://www.innov-x-sys.com/>.

Chemicals of Concern: This study analyzed chemicals contained in materials that pose significant environmental and health concerns. Many of the chemicals tested have already been subject to regulatory restrictions around the world. Lead, mercury, chromium and cadmium have been restricted

in vehicles by the European Union's End of Life Vehicle Directive. BFRs have been regulated by the EU's Restriction on the Use of Certain Hazardous Substances in Electronics and Electronic Equipment (RoHS Directive) (see http://ec.europa.eu/environment/waste/weee_index.htm) The study also tested for PVC, a common halogenated plastic that contains phthalates that are known to cause reproductive and other health problems.

In a recent related report, the Ecology Center found that the dust in vehicles is a significant source of phthalate and brominated flame retardant (BFR) exposure for many Americans. The study found that dust samples taken from newer model vehicles contained much higher levels of BFRs than dust from homes and offices. The study also found that UV rays and heat may cause certain BFRs to breakdown inside cars into more toxic compounds that have been banned by government health agencies and the auto industry due to their toxicity. Full report available at: www.ecocenter.org/toxicatanyspeed.shtml.

Typically, BFR's are not chemically bound to plastic or fabric, so they are released as dust or vapors over the lifetime of the product. There is strong scientific evidence that levels of certain BFRs are rising rapidly in the environment, in the food chain and in human bodies. BFRs impair memory, learning, and behavior in laboratory animals at very low levels. They also affect thyroid hormones and other bodily functions.

Findings: Our research shows that the amount of hazardous materials in vehicle interiors varies greatly between vehicle models. A wide range of vehicles are virtually free of the most harmful chemicals, while many others are still produced using significant amounts of those chemicals. The data and ratings will allow consumers to know for the first time which vehicles use the most harmful materials before they make their purchase.

The Ecology Center has completed samples of 175 vehicles and will be completing sampling of most 2006/2007 model year vehicles in the Fall 2006. A draft list of the "Best Picks by Vehicle Class" is presented below. This list includes the two highest ranked vehicles in each vehicle class.

Best Picks By Vehicle Class (Draft 10/30/2006)		
Small Cars:	Chevrolet Cobalt	VW GTI
Family Sedan:	Toyota Prius	VW Passat
Upscale Sedan:	Cadillac CTS	BMW 330i
Luxury Sedan:	Acura RL	Mercedes S550
Station Wagons:	Volvo V50	Suzuki Aero
SUV:	Chrysler PT Cruiser	Chevrolet HHR
Pick-ups:	Ford F-150	Dodge Dakota Club
Minivans:	Ford Freestar	Honda Odyssey
Sports/Sporty Car:	Mercedes CLK350	Mazda Miata MX-5
Covertibles:	Mercedes SLK280	Chevrolet Corvette

Sample vehicle fact sheets showing locations sampled and results are attached.

About the Ecology Center: The Ecology Center is Michigan-based non-profit environmental organization that works for safe and healthy communities where people live, work and play. The Ecology Center's Clean Car Campaign works to address environmental and health impacts of the production, use and disposal of vehicles in the U.S. The Clean Car Campaign is one of the lead groups addressing chemicals in vehicle, having issued a series of reports on chemicals in vehicles over the last 6 years: including mercury, lead, brominated flame retardants and plasticizers and an annual assessment of sustainability of auto plastics. For more information visit ecocenter.org or cleancarcampaign.org, or contact Jeff Gearhart, Ecology Center 734-663-2400 x 117

2007 Chevy Silverado



The Chevy Silverado was the poorest performing vehicle in the truck sector. Most components, including the seats, contained brominated flame retardants (BFRs). The Silverado is one of a small number of vehicles tested that still uses BFRs in seating. The vehicle also had extensive use of PVC in the armrest, shift knob, hard and soft door trim, and wiring. Safer plastics for each of these applications were used in a number of other Chevy products.

Results for 6 (of 15) Locations Sampled in Silverado



Note: 10,000 PPM = 1% by weight

2006 Chrysler PT Cruiser



The Chrysler PT was the top performing small SUV tested and one of the best vehicles overall. The vehicle exemplifies the use of materials that result in a healthier vehicle interior and reduced impacts on the environment. No brominated flame retardants (BFRs) were present in any of the 15 components tested. The only use of softened PVC was in the soft door trim. Soft PVC contains plasticizers that contribute to the “new car smell”.

Results for 6 (of 15) Locations Sampled in PT Cruiser



Note: 10,000 PPM = 1% by weight

2007 Lincoln Town Car



The 2007 Lincoln Town Car was the lowest ranked luxury sedan and one of the lowest ranked vehicles overall. The Town Car is one of the few vehicles tested that still has a PVC instrument panel. Many of the interior components tested were PVC, including the seating fabric, seat base and door trim. Most of the components tested also contained brominated flame retardants.

Results for 5 (of 15) Locations Sampled in PT Cruiser



Note: 10,000 PPM = 1% by weight