Sympatex Technologies GmbH

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New laboratory study reveals that highly-toxic hydrofluoric and hydrochloric acids are released when PTFE burns

Main (ots) -

The independent institute Warringtonfire Frankfurt GmbH examines impact of incineration of PTFE, Polyurethane and Polyester membrane grades in an open fire in accordance with EN ISO 5659-2 (NBS smoke chamber). Given the growing global "tourism" of used clothing and textile waste, the results of the analysis are especially critical when it comes to product responsibility for manufacturers and recyclers of PTFE clothing.

As part of a smoke density and smoke toxicity test of the most common membrane materials for functional textiles in line with EN ISO 5659-2 (NBS smoke chamber), the Frankfurt-based Warringtonfire institute detected concerning levels of highly-toxic hydrofluoric acid (HF, up to 63 ppm) and hydrochloric acid (HCl, up to 36 ppm) when incinerating PTFE membranes. The test is normally used to evaluate the incineration risks of materials built into vehicle interiors such as trains, aircraft and automobiles, as well as in buildings. Its aim is a suitable classification to avert acute health hazards to passengers in case of fire.

The laboratory-scale results found do correlate to burning the amount of membrane material found in an outdoor jacket inside a five-square-meter space. The tests suggests that when a commercially-available functional jacket containing a PTFE membrane burns in open fire, the quantities of hydrofluoric acid (HF) that it emits can be deadly to any person directly exposed to the fumes for 30 to 60 minutes. Furthermore, the hydrochloric acid (HCl) that is also released when PTFE merely burns can lead to serious lung burns if the fumes are inhaled, potentially causing irritation and burning of the mucous membranes and respiratory tract.

These results are particularly troublesome considering that roughly 50% of the textiles collected around the world (this affects some 70% of all used apparel in Germany, 50% in the UK and 15% in the US) are sold for re-use via recycled clothing systems to low-income third countries - a growing global business worth billions[1]. The most common way to dispose of waste in these countries is through (uncontrolled) waste dumps or open incineration. We can thus assume that from a pure statistics standpoint, roughly 15 to 20% of our clothing ends up on open incineration piles or pits in the direct vicinity of residential areas. With longevity textiles such as outdoor apparel, which frequently utilize one of the three tested membrane materials, this percentage is presumably much higher given the increased likelihood of the material enjoying an export-based "second life."

The standardized test process determined the concentration levels of the most common toxic fumes released through all of the three types of membranes: Polytetrafluorethylene (PTFE), Polyurethane (PU) and Polyester.

Unsurprisingly, the test revealed that CO2, (carbon dioxide), CO (carbon monoxide) and NOx (nitrous gases) are released, all substances that are discharged when other organic materials such as wood, coal and diesel fuel are burned. The researchers furthermore discovered that all of the materials released smaller quantities of hydrogen cyanide. While below levels that are toxic to humans, they nevertheless correlate roughly to what one can expect while exposed to a pub atmosphere where 15 to 25 guests have smoked 10 cigarettes each. The levels with polyester were around one-third lower than for the other two materials.

PTFE membranes were the only material where in addition, high levels of HF (63 ppm) and HCl (36 ppm) were measured. The primary path of entry for hydrofluoric acid (HF) is through the respiratory tract and the skin. According to the EU guideline 2000/39/EC, the occupational exposure limit as an 8h mean value is 1.8 ppm, and 3 ppm as a short-term threshold. The IDLH value (immediately dangerous to life or health) is set at 30 ppm. The basic assumption is that for humans, 30 to 60 minute exposure to HF at a concentration level of 50 ppm can be fatal.

"With an economy that has become global, we must accept responsibility on a system level as well. This means not only applying the highest standards to our products when they are created, but also ensuring that our products leave no dangerous traces at the end of their life cycle. With this in mind, we have set our goal to completely close our material loop by the year 2030. This allows us to not only conserve raw materials, but will at the same time also avoid potential collateral damage during the disposal process," explains Dr. Rüdiger Fox, CEO of Sympatex Technologies. "Still, in light of the growing challenge of global trash tourism, which China finally exposed around 18 months ago with its ban on the import of plastic and textile waste, not to mention images of out-of-control incineration piles, we cannot simply shut our eyes to the current situation. If 40% of the global waste is incinerated in open fires without any controls[2], then we must make sure that humans do not end up as collateral damage. The EU directive (2008/98/EC) covering waste handling, disposal and recycling outlines this responsibilities of manufacturers in clear and plain language."

The entire analysis can be downloaded from the Sympatex Newsroom at www.sympatex.com/newsroom.

About Sympatex

Guaranteed Green - The Sympatex climate-neutral and recyclable membrane As one of the worldwide leading producers, Sympatex® Technologies has been a synonym for high-tech functional materials in clothing, footwear, accessories and technical fields of application since 1986. Together with selected partners, Sympatex develops, produces and distributes membranes, laminates and functional textiles as well as finished products worldwide. The Sympatex membrane is highly breathable, 100% wind- and waterproof and regulates the climate. It is 100% recyclable, climate-neutral, bluesign® certified, and it received the 'Öko-Tex-Standard 100' certificate. It is also PTFE-free and PFC-free. The technologies and procedures are based on the principles of ecological responsibility and sustainability with a special focus on the optimal carbon footprint. Sympatex is represented worldwide with sales offices and branches. www.sympatex.com

[1: UN 2015 Global Waste Mgmt Outlook: 1.26 bln. $ (2001)
respectively 2.5 bln. US$ (2009)]

[2: National Center of Atmospheric Research (NCAR)]

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Closing the loop - sustainable functional textiles can be recycled again. Editorial use of this picture is free of charge. Please quote the source: "obs/Sympatex Technologies GmbH"