

Polyurethane

PUBLIC INFORMATION

December 2023

A versatile material with uses for a more sustainable Europe

One of the key uses of chlorine is in the production of an essential modern polymer; polyurethane. There are many vital uses of this material due to the range of different forms it comes in. Regardless of which type of polyurethane though, all are important for Europe and can play a role in a more sustainable continent.

Each year around 30 million tonnes of polyurethane are made worldwide and, in Europe alone, over 360,000 jobs are associated with the production of products related to it. It is further estimated that 5.1 million Europeans rely on this important modern polymer as part of their work.

Polyurethane (also known as PU or PUR) was first made in the 1930s in Germany to replace rubber and it has strong links with chlor-alkali chemistry. The first step in their production is the preparation of isocyanates which can be carefully made using chlorine-containing chemicals. These are joined with polyols to make a monomer which is the foundation of polyurethane. Polyurethane is one of the top two uses of chlorine in Europe.

Recently, industry has worked hard to ensure that people who are making these chemicals are well trained to be able to handle them safely and efficiently.

Properties and uses

The secret to polyurethane's success is that it can come in many different forms including rigid, flexible, foam and also liquid types. This has allowed polyurethane to find an essential 'home' in many key products for society.

One of its most important uses is in insulation materials as the foams form excellent 'layers' to keep heat energy where it needs to be. These foams are therefore an excellent insulator for buildings, refrigerators and more. They can keep heat in your home during winter or keep it out during the summer meaning lower energy bills and reducing the carbon footprint of your house. This is vital as it is estimated that the proper insulation of buildings could reduce global CO₂ emissions by 20% and help in part to meet EU climate goals. They can also be put into spray foams to make sealants to help keep the rain out of gaps in houses (such as around loose fitting window frames).

Polyurethane's insulating properties are also truly out of this world as astronauts can rely on polyurethane in space suits whilst offshore personnel can rely on them in cold water survival suits.

Another important use of polyurethane foams is in comfortable furniture cushions and mattresses to give you a good night's sleep. One interesting feature of this particular use is that flexible polyurethane foam is easily recycled. Every year, over 40 million mattresses are discarded in Europe. If these were stacked on top of each other it would make a pile over 8,000 km high and be the equivalent of 300,000 tonnes of wasted polyurethane.

Some polyurethane is used in certain furniture and mattresses to give outstanding comfort in some of Europe's leading hotels.



With help from governments, industry has been working hard to reuse this resource and improve the circularity of this important material.

Using special chemical techniques, it is possible to break down these mattresses into individual base chemicals. These raw materials can then be used to make more foams for use in things like new mattresses.

Polyurethane also has a role in transportation where it is found in things like car bumpers and seat padding. These uses are vital as they can help to reduce vehicle weight by up to 30% meaning less fuel is needed to get you around town. More rigid forms of polyurethane are found in smaller 'wheeled' devices such as shopping carts, wheelbarrows and lawnmowers.

Polyurethane can also play a role in sporting equipment. These include as support in running shoes or to make strong and sturdy roller blade wheels. It can make tennis grips and cutting edge swim suits. It can be used to make a form of 'spandex' for sport and fashion-wear. It can even make surf boards and small inflatable boats!

There are even some niche uses of polyurethane such as in coatings for hard, abrasion resistant flooring or to help repair sea walls that protect our coastlines. Polyurethane's versatility means it can make protection in various electrical casings or in adhesives for glues in woodworking or to bind books. It is also found in some bathroom sponges to keep your home clean or in medical tubing and wound dressings.

With a little bit of help from chlor-alkali chemistry, polyurethane is a truly circular material for an even more sustainable Europe!

Much more about chlor-alkali at www.eurochlor.org.

