Nylon Encyclopedia Article

Nylon

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Nylon was developed at Du Pont by Wallace Hume Carothers and his research team. Du Pont had made a commitment to find an artificial substitute for silk. They knew that the market for silk stockings was a $70 million business and an inexpensive material with the properties of silk was bound to be successful. After several years of research, Carothers had almost given up on finding a substitute, when he and the team discovered the secret of *cold drawing*.

In 1930, Carothers and Julian Hill, his assistant, developed equipment that led to the breakthrough. They wanted to form long chain polyester. The polyester was formed by reacting diacids and diols. This reaction also formed water, which caused the polyester to revert to the original reactants. The equipment they invented removed the water as it was formed, resulting in a high molecular weight polyester. Hill noticed that he could stretch the material into a fiber. He and the other research members stretched the polyester down the hall of the laboratory. They realized that the fiber grew silkier and stronger as it was drawn out. By doing this they had inadvertently discovered the process of cold drawing. Cold drawing orients the molecules into a long linear chain and fosters strong bonding between molecules. Unfortunately, the polyester Julian Hill used had a low melting temperature and was unsuitable for textile applications.

Eventually, Carothers was persuaded to try the experiment using polyamides. In 1934, Donald Coffman, another assistant, drew out the first nylon fiber and by 1935, a polyamide called *Nylon 6,6* was identified as the most suitable substitute for silk. The first nylon stockings went on sale in the United States in 1938. By 1941, 60 million pairs were sold. During World War II, however, stockings became rare as nylon was diverted to the war effort and used in parachutes, mosquito netting, ropes, blood filters, and sutures.

Today, nylon is forced through small holes in a flat plate, called spinnerettes, to form fibers and then stretched by passing it through a pair of rollers rotating at different speeds. This process stretches the fiber several hundred percent and increases its strength by more than 90 percent. Nylon is stronger than steel by weight and is almost inflammable. It is used in clothing, laces, toothbrushes, strings on musical instruments, sails, fish nets, carpets, and other products requiring strong, lightweight fibers.