

+ What is cuprammonium rayon?

Cuprammonium rayon is a regenerated cellulosic fiber made from cotton linter dissolved in cuprammonium solution. Cotton linter is the short downy fiber that enfolds the cottonseed; it is an agricultural by-product.

Cuprammonium rayon is usually made into fine filaments that resemble silk or other luxurious fibers. It is often used in lightweight fabrications, sometimes in combination with cotton, to make textured fabrics with slubbed, uneven surfaces.

Cuprammonium rayon may also be known as “cupro” or “cupra” and may be referred to as “ammonia silk.”

+ How is cuprammonium rayon made?

Cuprammonium rayon is made from cellulose dissolved in cuprammonium solution. It is a three-step process.

1. The insoluble cellulose is made soluble by combining it with copper and ammonia in sodium hydroxide.
2. The solution is passed through a spinneret, which resembles a showerhead, to make slender, threadlike fibers.
3. The cellulose is regenerated into a solid fiber through a “hardening” process. Sulfuric acid is used as the hardening agent, and it also removes the copper and ammonia and neutralizes the sodium hydroxide.

+ What currently limits cuprammonium rayon as an input for the circular economy?

One of the biggest issues with cuprammonium rayon as an input for the circular economy is the use of wasteful auxiliary hazardous chemicals used in the manufacturing process.

- + Sodium hydroxide and sulfuric acid are both corrosive and care should be taken during handling. Both can have a negative effect on effluent.
- + Ammonia is corrosive and exposure in air causes burning of the eyes, nose, throat and respiratory tract. It can result in blindness, lung damage or death.
- + Copper sulfate can cause severe eye irritation.

It should be noted that these chemicals are used in manufacturing and are not present on the end product.

The copper used in the cuprammonium is also often sourced from virgin material, even though copper is highly recyclable.

Cellulosic fibers are biodegradable, however, the finished textile is enhanced with chemicals, such as dyes, softeners and other finishing agents, that undo biodegradability.

+ Why was **cuprammonium rayon** chosen for the Call to Innovation?

Cuprammonium rayon was chosen for the Call to Innovation because, if produced under the correct conditions, it has the potential to meet GOLD level certification requirements in the Cradle to Cradle Product Standard. The fiber is derived from a by-product of cotton growing, which means that it is diverting waste from the landfill.

It is made in a closed loop manufacturing process in which the chemicals are completely recovered and do not come in contact with workers or the environment.

It is also a versatile cellulosic fiber and used in a variety of apparel items by many brands.

+ What is the action plan for **cuprammonium rayon** through the Call to Innovation?

Fashion Positive PLUS members have identified Asahi Kasei Corporation in Japan as a partner because they manufacture Cupro, the branded version of cuprammonium rayon. Based on their manufacturing process, Cupro has high circular potential. Asahi Kasei's production process uses zero-waste, closed loop manufacturing in which copper sulfate, a toxic chemical, is fully recovered. Any cellulosic waste is used as fuel to generate electricity.

The Fashion Positive PLUS members engaged Asahi Kasei in May 2017 to begin the certification process for Cupro. Once Cupro has been optimized and certified, it will be added to the Fashion Positive Materials Collection.

+ What's exciting about priming **cuprammonium rayon** as an input for the circular economy?

Cuprammonium rayon is growing in popularity because of its sustainability attributes as well as its desirable aesthetic. There is also potential in using cuprammonium rayon as a replacement for silk.