



SPHERICAL COPPER CARBONATE

A Case Study



CHALLENGE

In search for butadiene, a primary component of synthetic rubber, scientists in the 1930s found that copper could catalyze the reaction of acetylene and formaldehyde to produce 1,4-butyne diol (BYD). While this original use has been supplanted, BYD remains an important intermediate in our modern world, going into THF, a valuable industrial solvent, PBT, a component of electrical cable insulation and, more than anything else, PTMEG, the molecule that makes Spandex stretchy. The problem with copper-catalyzed

acetylene chemistry was its tendency to explode due to elevated temperatures and pressures, limiting its applicability and adoption. It wasn't until the 1970s that scientists at **DuPont collaborated with metal chemistry experts at The Shepherd Chemical Company to develop a custom designed bismuth-doped copper carbonate catalyst precursor** that would help fuel this technology's safe, economical and growing implementation.

SOLUTION

The Shepherd Chemical Company has served as a trusted partner for the development of copper carbonate, supporting safer worldwide production of the chemicals that comprise Spandex and other important materials. Our first Spherical Copper Carbonate (SCC) particle, designed in collaboration with DuPont in the 1970s, provided improved performance for BYD applications, while inhibiting the formation of undesirable byproducts like cuprene, which disrupt the manufacturing process. SCC also increases safety for the manufacturing of BYD by reducing the operating pressure from 20 bar to 1 bar, lessening the risk of explosion to operators.

It's thanks to our precisely controlled process of aqueous precipitation, which permits finely tuned particle size, surface area, morphology, consistency and stability, that Shepherd Chemical remains the supplier of choice in this industry for over 4 decades. Over the years, we've supported our customer in winning several patents that improve the process for producing BYD, the global production capacity for which has grown from 1500 kta in 2004 to 4500 kta in 2017.

**MAJORITY SUPPLIER WITH
> 50% MARKET SHARE**

ETHYNYLATION CATALYST

**INCREASES MANUFACTURER
SAFETY**

**15 PLANTS UTILIZING
SCC TECHNOLOGY**

40 YEARS EXPERIENCE

**REDUCES OPERATING
PRESSURE FROM
20 TO 1 BAR**



1
**Reducing filter
clogging, extending
run length**



2
**Minimizing down
time**



3
**Decreasing the
number of catalyst
change-outs**

RESULTS

- Increases manufacturer plant safety by reducing operating pressure from 20 to 1 bar
- Extends run length by reducing filter clogging
- Reduces down time by decreasing the number of catalyst change outs

OUR LATEST INNOVATION

Shepherd Chemical understands that one of the biggest challenges in the BYD market today is to develop a catalyst with a long lifetime. Our latest product, Spherical Copper Carbonate “Extra Life” (SCC XL) optimizes our decades-long improvements to the catalyst and production process, providing larger particle size, fewer small particles (called “fines”), greater surface area, and improved packing. Most importantly, **SCC XL lasts longer than earlier iterations, allowing for increased production, decreased cost, and enhanced safety of BYD per pound of catalyst.** We designed SCC XL to enhance performance, optimize surface area, and limit fracturing during the BYD manufacturing process.