RECOUP

Leading a more circular plastics value chain

Calcium Carbonate $CaCO_3$ Fillers Fact Sheet

This fact sheet is produced to provide information on current topics within the plastics recycling industry. All information reported within this fact sheet is based on current manufacturing and infrastructure within the UK, and is produced with the support of RECOUP members and experts from the plastics industry.

What is $CaCO_3$?

$CaCO_3$, or to use its common name calcium carbonate is a natural substance found in geological formations such as limestone, as well as the primary constituent of eggshells and shellfish skeletons.

Calcium carbonate can be sythnetically produced by combining calcium ions with carbonate, releasing carbon dioxide and water in the process. It is also found naturally all over the world in the form of shellfish sediments and fossils.

What is it used for?

$CaCO_3$ is commonly used as a bulking agent in plastic packaging due to it's low cost (around £250 per tonne, compared to £1000 per tonne for the polymer). Adding calcium carbonate to polymers such as polypropylene impacts the properties of the polymer, making it more brittle and weakening the structure. It does have some added benefits, such as reductions in post mould shrinkage, improved barrier qualities, impact strength and heat resistance. It also gives a boost to the glossiness and opacity of the packaging.

What are the issues with fillers?

Calcium carbonate use does have some drawbacks when it comes to recycling of the packaging. During sorting the use of fillers can have an effect in the near infrared signature of the polymer, meaning it may not be detected. As a filler calcium carbonate is usually used in low quantities, below 5%, if it is used in concentrations greater than this, however, it will increase the materials density causing it to sink during the washing process, which lowers the polymer yield and contaminates other polymer streams.

We asked the experts:

'If we were to receive either PP or HPDE with a high loading of calcium carbonate we would be able to recycle it into jobs that require fillers. A small amount of filler can be useful as it prevents post mould shrinkage. Anything higher than 5% filled would not be put through the wash process and would be dry granulated and used in small amounts with other polymer to dilute the effect of the filler.' - *Jonathan Attwood, IPL Global Brightgreen*

Main benefits of $CaCO_3$

- Reduces post mould shrinkage
- Enhances heat resistance
- Increased impact strength
- Improved stiffness / hardness
- Improved glossiness / opacity
- Reduced permeability / increased barrier properties
- Relatively cheap
- As bulking agent, reduces plastic content
- Can reduce manufacturing costs
- Recycling filled grades reduces packaging tax burden

Main drawbacks of $CaCO_3$

- Increased material density
- Reduced impact toughness (effect increases with the coarseness of the filler)
- Higher density of $CaCO_3$ could lead to false economy savings
- May affect the infrared signature of the polymer
- Loading >5% sinks during float / sink separation, which may contaminate other streams
- Materials sinking in float / sink also lowers polymer yield
- Filled materials >5% will be dry granulated and used in smaller quantities to dilute the effects in post consumer recycled materials