

who offers a  
new toolbox of  
extrusion binders?

—  
we do.



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# next generation extrusion binders

who gets fired up at the thought of solving a problem?

—

we do.

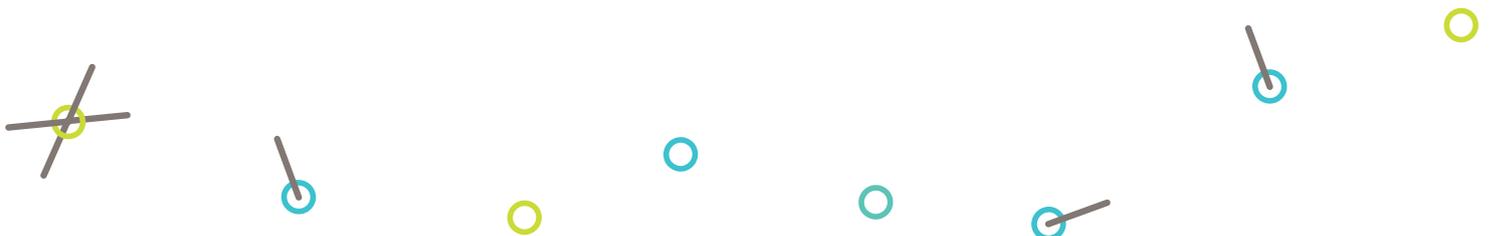
Ashland products are used in many traditional and advanced ceramic applications. Depending on whether the shaping process is starting with wet (slurry/slip), dry (spray dried/granulated) or plastified base materials the functionalities range from improving dispersibility of inorganic materials in the solvent over foam control, binding (wet and dry green strength), film formation, plastification, extrudability, controlled drying and many more.

Extrusion is often used as a process to shape materials into various structures (from very simple to very complex shapes such as e.g. rods, tubes and honeycombs).

## **organic “binders” such as cellulose ethers are added to**

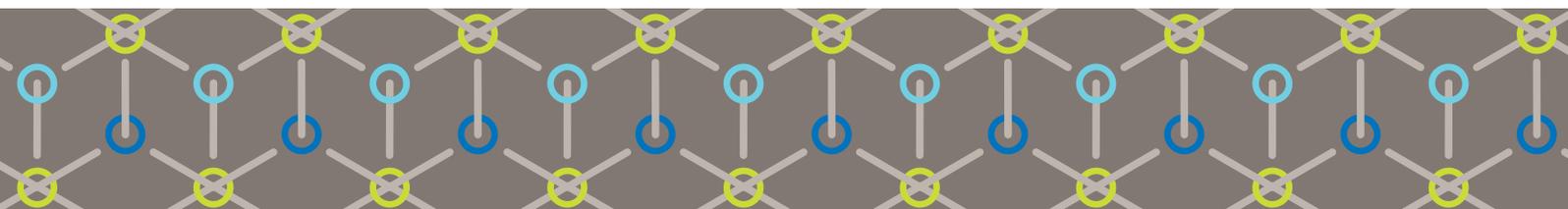
- plastify the raw materials so that they can be extruded
- add lubricity and reduce pressure while extruding
- provide green strength and secure shape retention once extruded and during the drying process
- burn out almost completely in the de-binding step

Independent of the end product Ashland's knowledge and products can help you to reduce waste and increase quality. A new set of extrusion binders (“trinity toolbox”) is introduced in this document together with product recommendations and typical properties, uses and benefits. The listed products were optimized in molecular weight, chemistry, purity and morphology to meet the specific demands of our customers.



who helps  
shape the future?

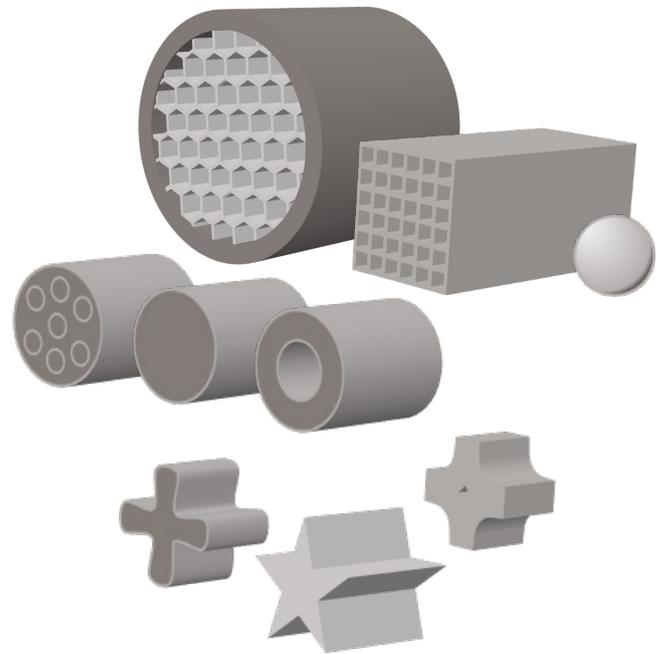
—  
we do.



# extrusion binder “trinity toolbox” for many extrusion applications

main types of extruded  
products for emission control  
products and industrial use

- ceramic catalyst carriers for mobile or stationary use (substrates)
- ceramic diesel or gasoline particle filters (for mobile and stationary)
- catalysts and catalyst carriers for industrial use
- bed topping media
- ceramic filter membranes
- activated carbon honeycombs, pellets or sheets (fuel recovery)
- powder-metallurgical parts

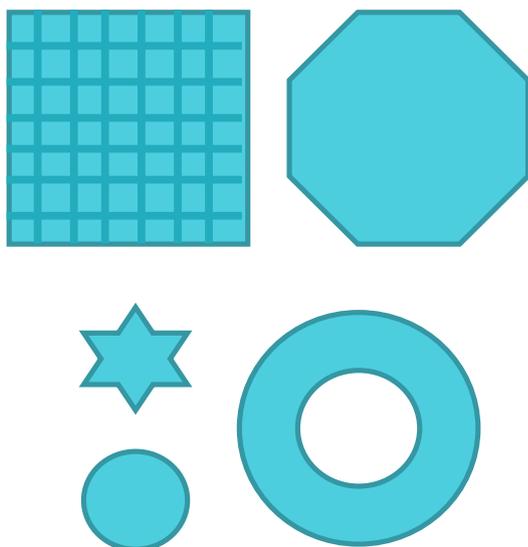


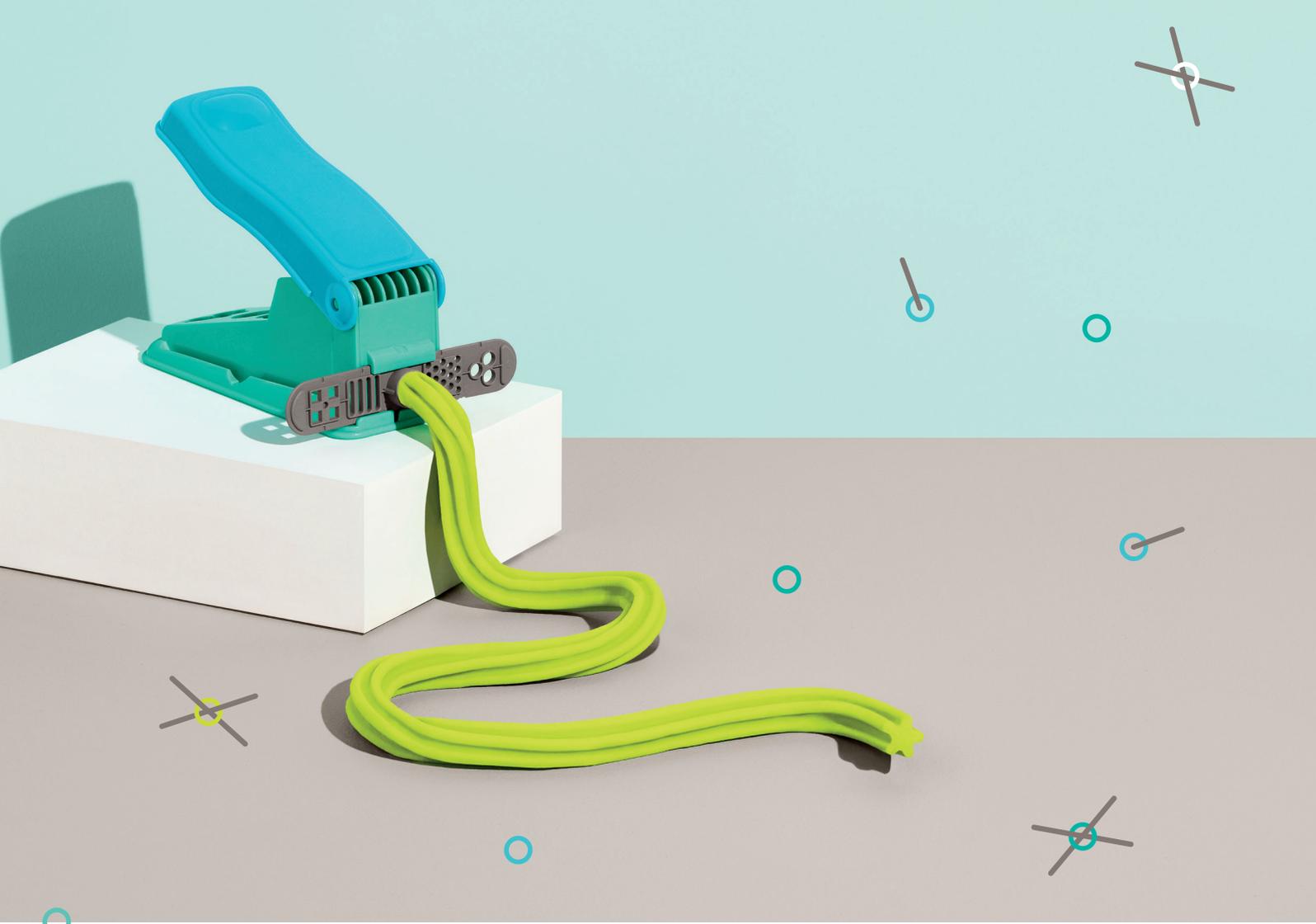
## background of binder “trinity toolbox”

different extrusion mixes and processes require different binders to bring optimum overall performance — one size does not fit all!

### some key parameters to be considered

- raw material choice and interactions
- equipment used
- addition of binder (powder versus stock solution)
- desired shape and complexity of extrudate  
— e.g. number of channels per area/cell density (cpsi) and wall thickness
- extrusion temperature window
- speed of extrusion
- pressure built in extrusion equipment
- drying process and behavior
- binder burn-out properties





## key properties of binders

### single binder or binder combinations

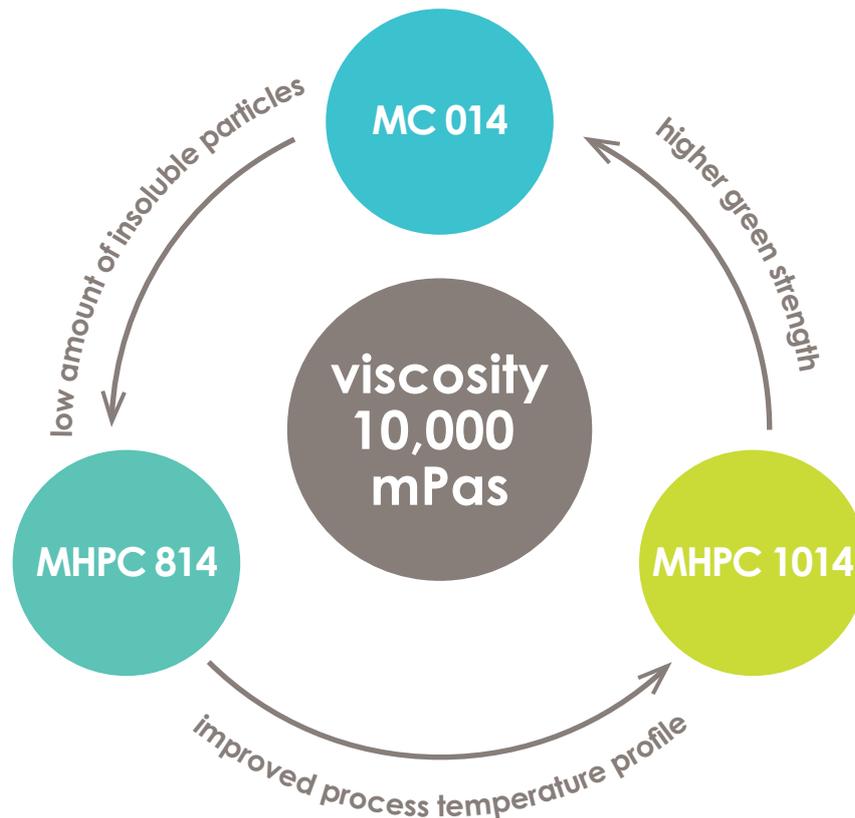
- reduced insoluble particles
- required green strength for optimum shape retention
- gel point optimized towards specific extrusion conditions/temperatures

### benefits

- portfolio extension to allow customers to adjust green strength and extrusion speed at process temperature by using combinations or single binders
- no need to change water demand when staying in the same viscosity range
- benefit of reduced insoluble particles
- low batch to batch variation in viscosity

# ceramic binder “trinity toolbox”

to adjust best rheology to meet specific process requirements



## MHPC 814

- very low insoluble particle content
- ultra thin wall-extrusion

## MC 014

- high gel strength
- high green strength
- excellent shape retention
- high density, low porosity

## MHPC 1014

- higher gel temperature
- broader temperature window during extrusion
- reduced insoluble particles

All grades above are optimized in terms of molecular weight, morphology and salt content.

- **molecular weight** was chosen to have good drying properties (homogeneous drying) and still sufficient water retention
- **morphology** was optimized to:
  - secure excellent distribution in the dry mix
  - allow quick swelling and dissolution of the binders
  - provide good handling / flowability
- **salt levels** are reduced to minimize impurities

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