

Simon Kemmerling

From glycolic acid  
to PGA – the  
continuous way

**REFUCOAT**

BIO-BASED RECYCLABLE PACKAGING



# Starting in lab scale

Lab scale reactor to  
screen reaction:  
conditions

- Temperature
- Pressure
- Time
- Few grams of material



**REFUCOAT**

BIO-BASED RECYCLABLE PACKAGING

# Transfer to continuous pilot scale

Continuous system to cover these requirements

- Removal of water
- Residence time
- Handling catalyst
- Vacuum
- Throughputs



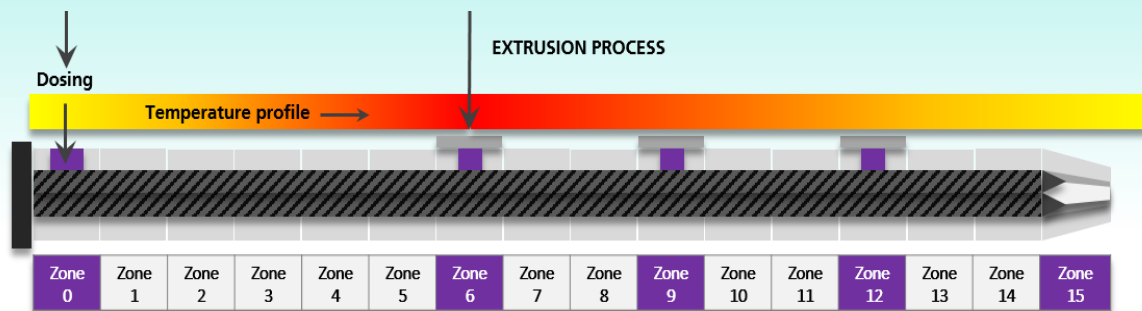
**REFUCOAT**

BIO-BASED RECYCLABLE PACKAGING

# Post condensation in reactive extrusion

Increase molecular weight  
starting from oligomers

- Removal of water
- Increasing viscosity
- Vacuum
- Additives
- Residence time



**REFUCOAT**

BIO-BASED RECYCLABLE PACKAGING

# Performance of processes to produce PGA

|                  | Laboratory polycondensation | Laboratory Ring-opening | Short path evaporator | Short path + postheating | Extrusion |
|------------------|-----------------------------|-------------------------|-----------------------|--------------------------|-----------|
| Throughput       | -                           | -                       | +                     | +                        | ++        |
| Scalability      | -                           | -                       | +                     | +                        | ++        |
| Molecular weight | +                           | ++                      | o                     | +                        | o         |
| Catalyst         | +                           | -                       | +                     | +                        | +         |

**REFUCOAT**

BIO-BASED RECYCLABLE PACKAGING