



# Polymer Additives – Our solutions at K 2019

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# Polymer Additives – Global setup

## Headquarters: Cologne, Germany

### Manufacturing:

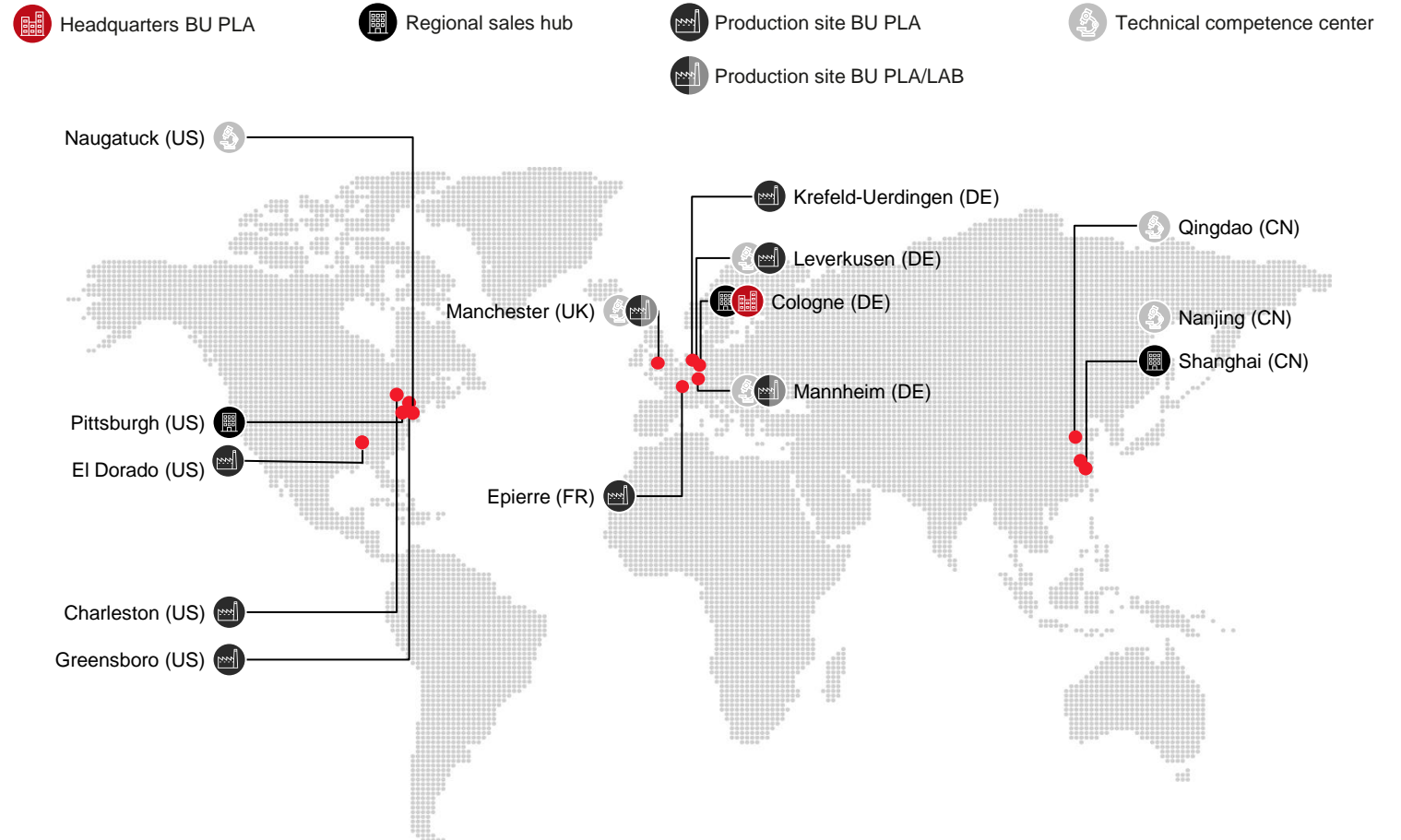
- 8 production sites in 4 countries

### Technical competence centers:

- Leverkusen, Germany
- Mannheim, Germany
- Manchester, UK
- Naugatuck (CT) & El Dorado (AR), USA
- Qingdao, & Nanjing China

### Regional sales hubs:

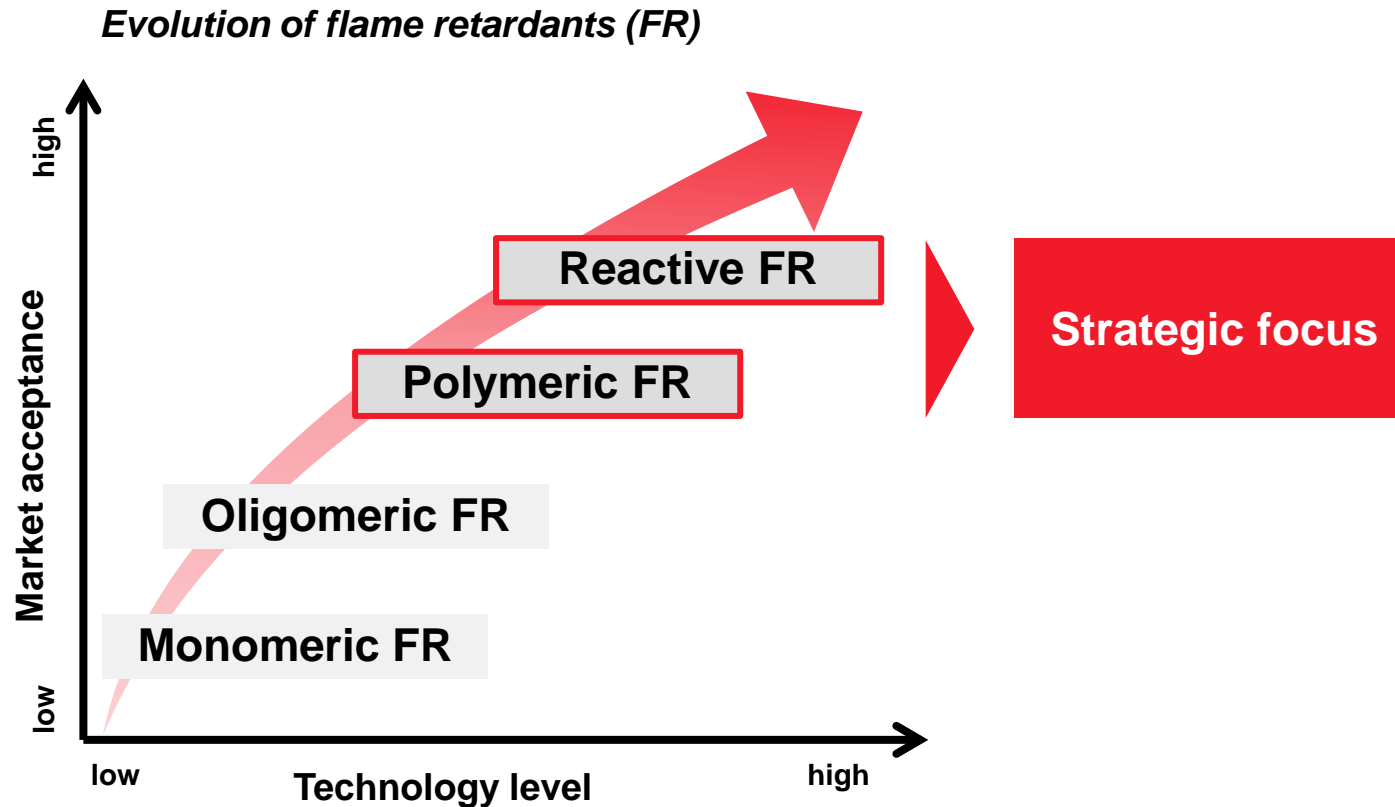
- Cologne, Germany
- Pittsburgh (PA), USA
- Shanghai, China



# Flame retardants are getting more sophisticated

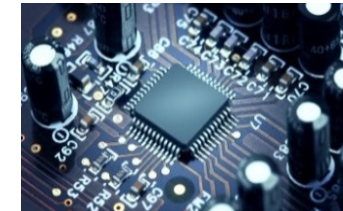
LANXESS drives innovation & technology

Among the top global players



Market shares:

# 1/2 in brominated flame retardants in Europe and # 2 globally



# 2 in phosphorous flame retardants in Europe and # 3/4 globally



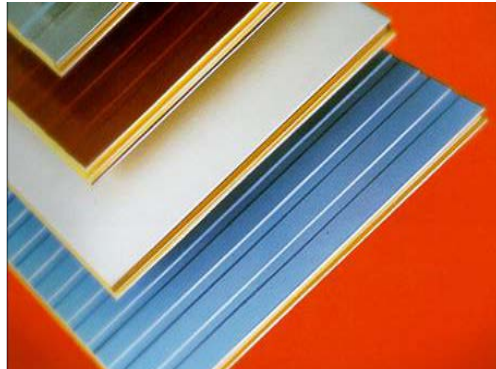
# **New sustainable developments in phosphorous based flame retardants**





# Phosphorous based flame retardants in rigid PU foam

## Rigid polyurethane foam



**Established application for phosphorus based flame retardants**

## Rigid PU foam

- Phosphorus based additives are the most prominent ones among flame retardants, helping rigid polyurethane foam to comply with various fire standards
- Growing concerns about certain additives used in this application
- Increased market interests in more sustainable flame retardant solutions

# New developments

## Levagard® 2000

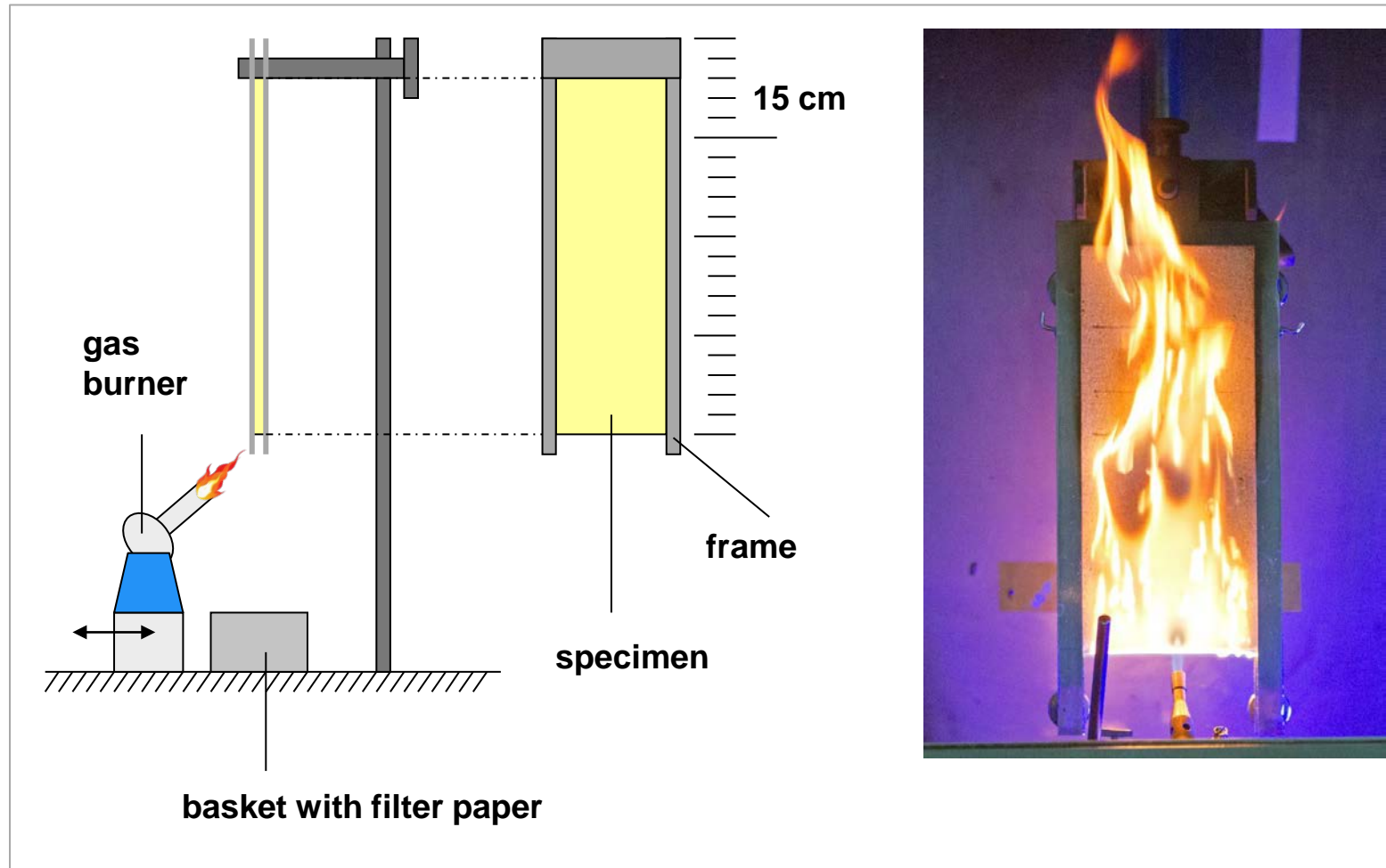
- Phosphorus content: 16.4 %
- Viscosity: 100 - 120 mPa·s (23°C)
- Low emission
- Oligomeric alkyl phosphate ester

## Levagard® 2100

- Phosphorus content: 18.4 %
- Viscosity: 25 - 30 mPa·s (23°C)
- Reactive organic phosphonate
- Chemically bound into the polymer
- No emission

**LANXESS has developed new flame retardant solutions for rigid PU foam**

# Fire standard EN ISO 11925-2 (DIN 4102 - B2)



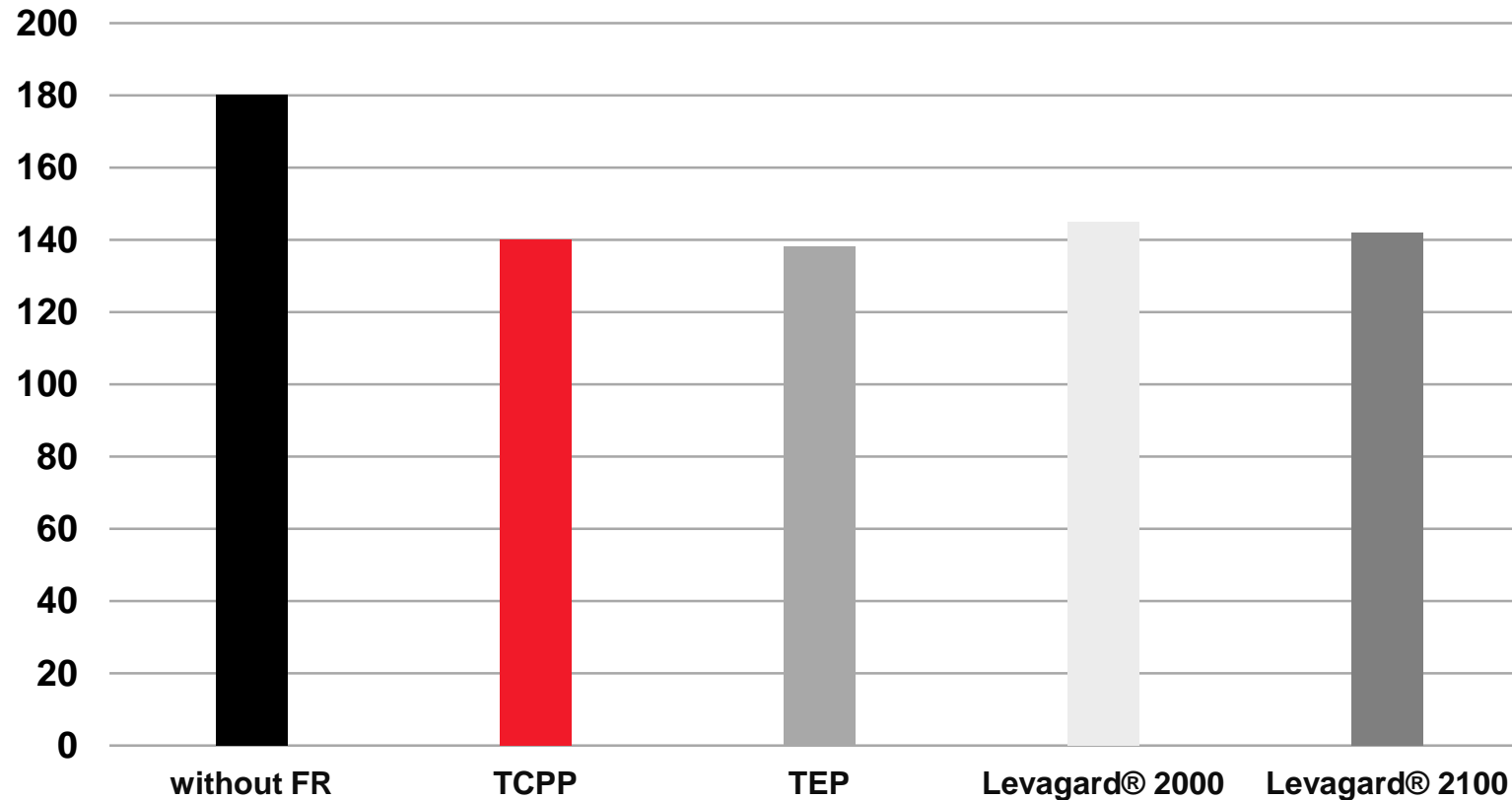
## Small burner – EU

- Flame length:  
20 mm / 0.79 inch
- Flame application:  
15 s or 30 s
- Test duration:  
20 s or 60 s
- Requirements:  
Flame height < 150 mm  
within 20 s or 60 s

# PIR foam

## EN ISO 11925 – flame height

### Flame height [mm]



### EN ISO 11925

- PIR foam with a foam density of 28 kg/m<sup>3</sup>
- All foams contain 25 php flame retardant
- All flame retardants improve the fire performance of the PIR foam
- All foams feature a similar fire performance expressed in similar flame heights



**Our sustainable brominated based  
flame retardant solution:**

**Emerald Innovation<sup>®</sup> 3000 for EPS/XPS**

Emerald Innovation is a trademark of LANXESS Deutschland GmbH or one of its affiliates, registered in many countries of the world.



# Flame retardants for insulating materials in the building and construction industry

## Our sustainable answer to growing concerns

- Insulation is an efficient and easy way to save energy
- EPS and XPS Polystyrene foams are effective and useful insulating materials in building and construction
- Polystyrene foams are combustible and must be equipped with flame retardants
- The traditionally used flame retardant additive HBCD (Hexabromocyclododecane) has been identified as a substance raising very high concerns (SVHC).



# Polymeric flame retardant for polystyrene

## Emerald Innovation 3000

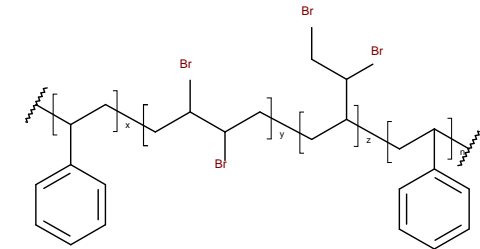
### Description

- Brominated styrene-butadiene polymer
- High molecular weight > 100,000 g/mol
- Product based on licensed technology from Dow Chemical Company

Appearance: White powder  
Bromine content: 65%  
Softening point: 120°C (TG)  
Thermal stability: > 250°C

### Application

- Flame retardant for polystyrene foam
- Expanded polystyrene (EPS) foam products
- Extruded polystyrene (XPS) foam products
- Building insulation



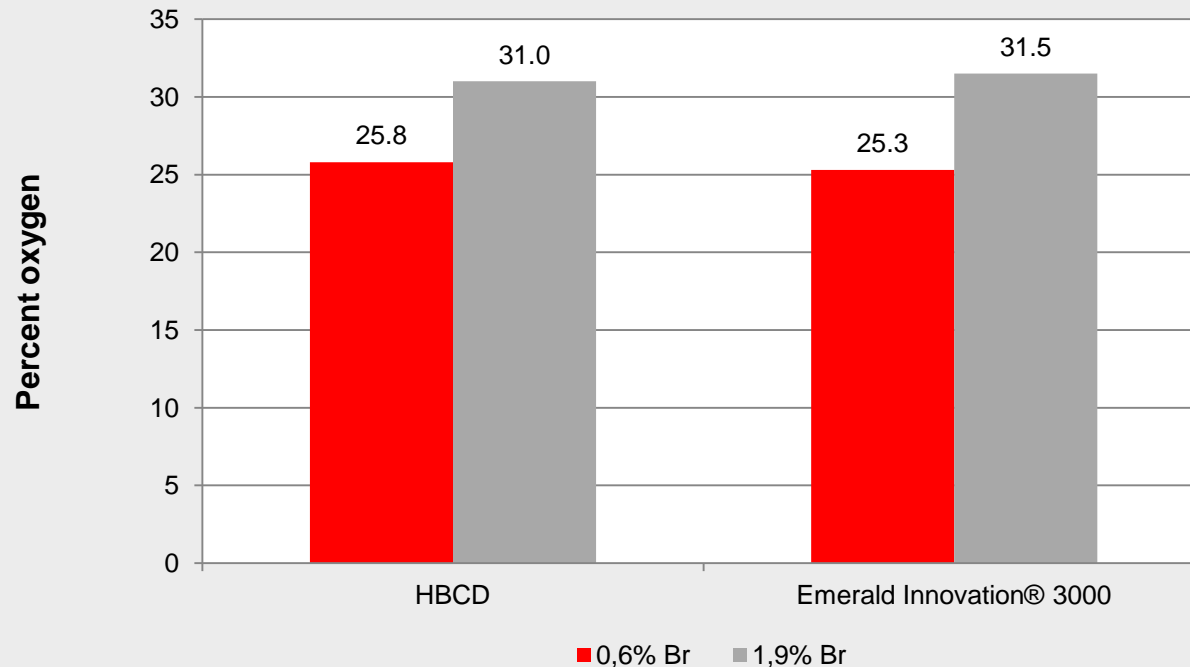
### Properties

- Provides comparable fire performance in polystyrene foam to standard flame retardants at equivalent bromine levels
- Polymeric structure overcomes concerns compared to small molecule flame retardants



# Fire Testing of polystyrene blends Emerald Innovation 3000 and HBCD

LOI of XPS foam

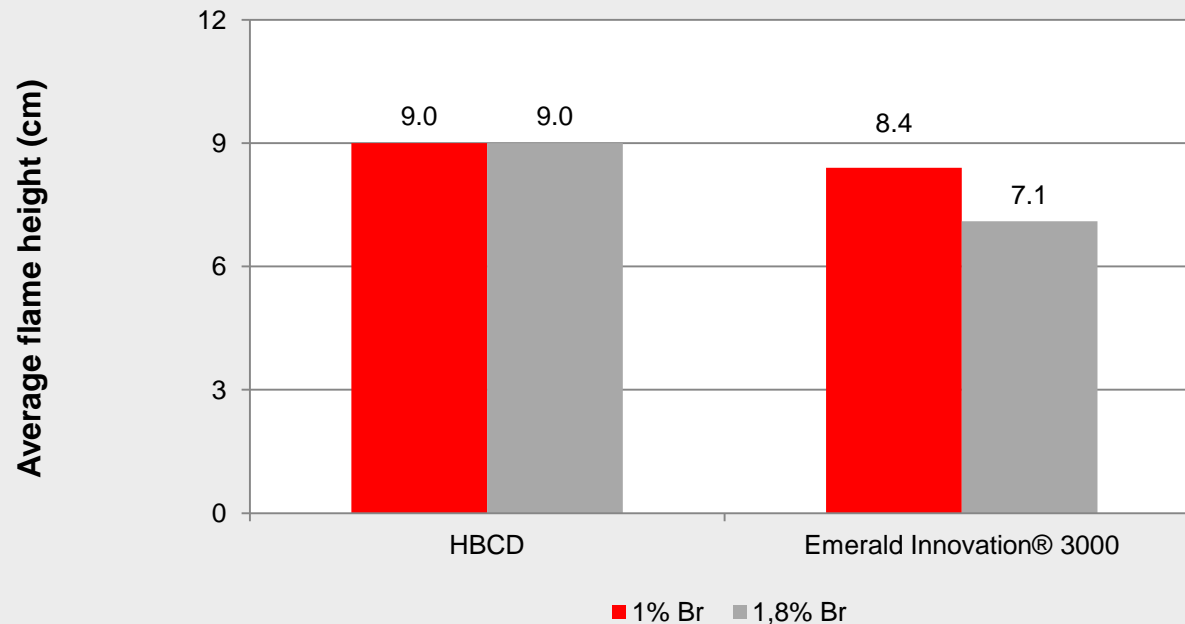


## Flame retardancy

- The LOI indicates the flammability of a material. It is the  $O_2$ -concentration which is required to keep a material burning
- The LOI of XPS foam with Emerald Innovation 3000 is equivalent to HBCD at same bromine content

# Fire testing – Emerald Innovation 3000 meets flammability requirements

German DIN 4102 B2 (small burner test) XPS foam



## Flame retardancy

- Emerald Innovation 3000 offers formulators the option to achieve applicable fire safety standards for polystyrene foam insulation like EN ISO 11925-2 and German DIN 4102 B2 flammability tests
- Trials demonstrate comparable fire retardant efficiency of Emerald Innovation 3000 versus HBCD at similar bromine levels



# Our flame retardant solutions for insulating materials



- The oligomeric Levagard® 2000 and the reactive Levagard® 2100 are new phosphorus based flame retardants for rigid PU foams
- The polymeric flame retardant Emerald Innovation® 3000 is a highly efficient, sustainable fire safety solution for XPS (extruded PS) and EPS (expanded PS) insulation materials
- The presented results demonstrate that the reactive and the polymeric flame retardants help to address the increasing requirements for rigid polyurethane and polystyrene insulation materials for the building and construction industry

**LANXESS**

Energizing Chemistry