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# Cold flow modelling of char concentration in the recirculated bed material stream of a dual fluidized bed steam gasification system

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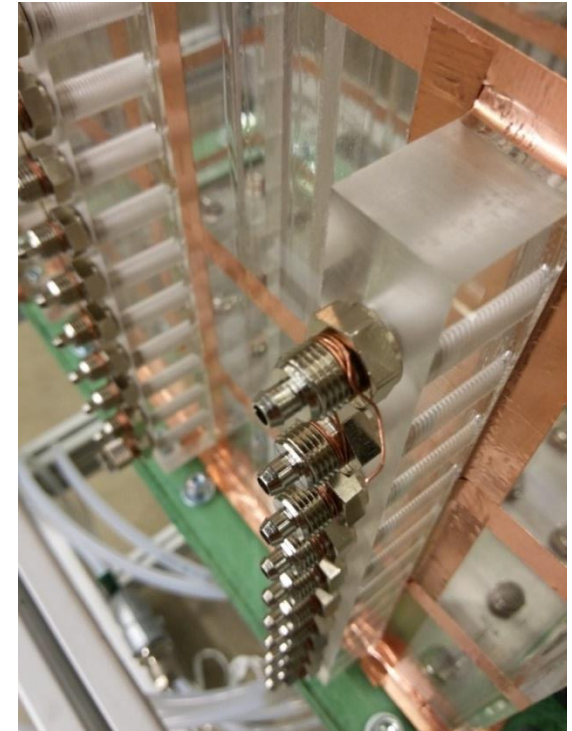
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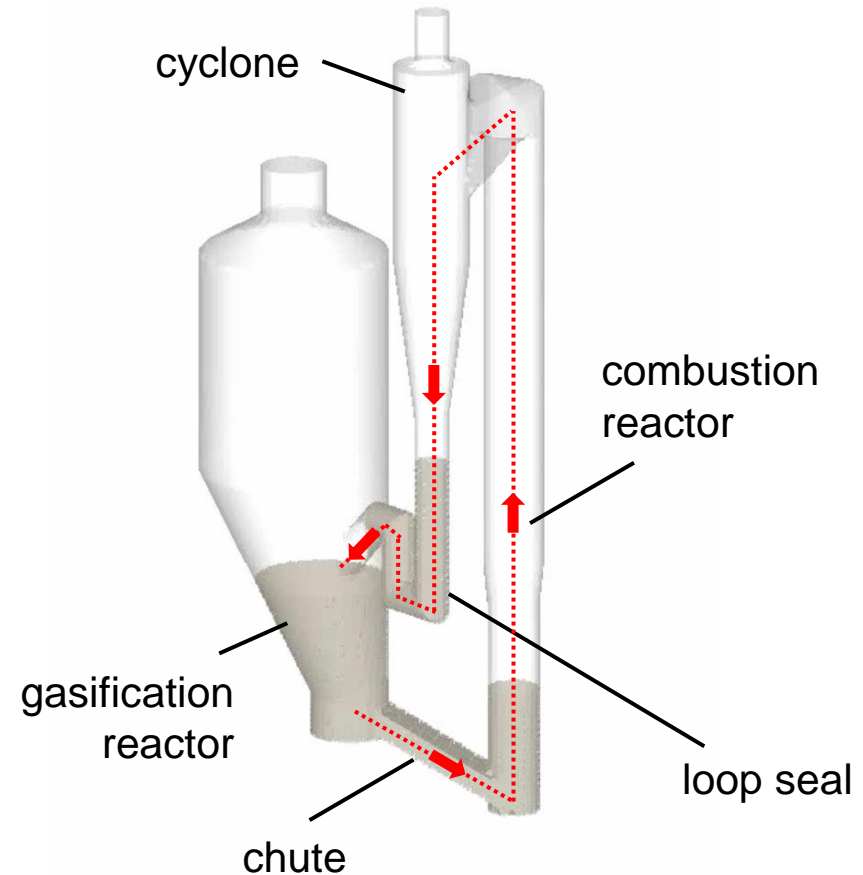
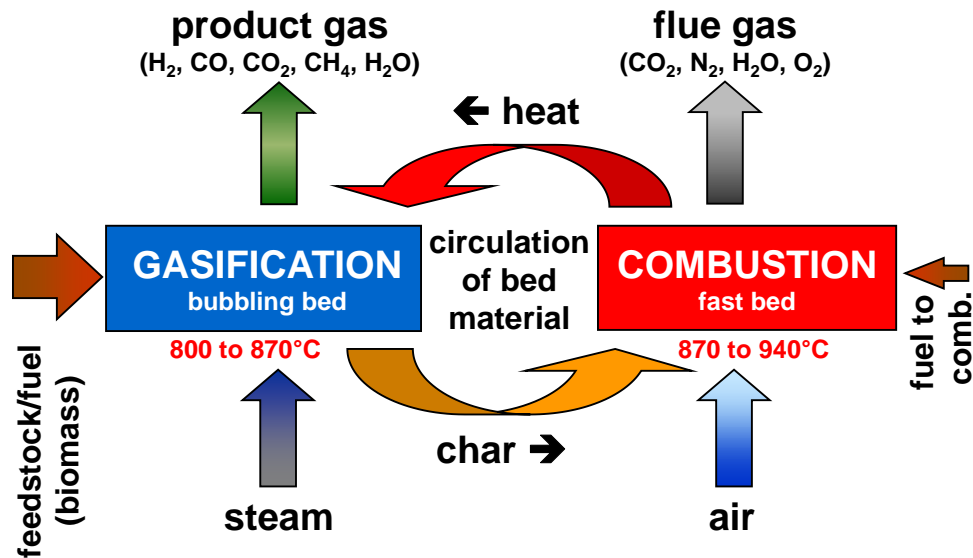


**Cold flow modelling of char concentration in the recirculated bed material stream of a dual fluidized bed steam gasification system**



Stephan KRAFT, Friedrich KIRNBAUER, Hermann HOFBAUER

# Dual Fluidized Bed (DFB) steam gasification





## Motivation

- many particle species: fresh & partly converted biomass, wood char, ash, bed material
- investigation of char concentration in bed material recirculation stream
- influence of operating parameters
  - fluidization rate
  - recirculation rate
  - char concentration
  - bed height

# Cold flow model. Design

## ■ requirements

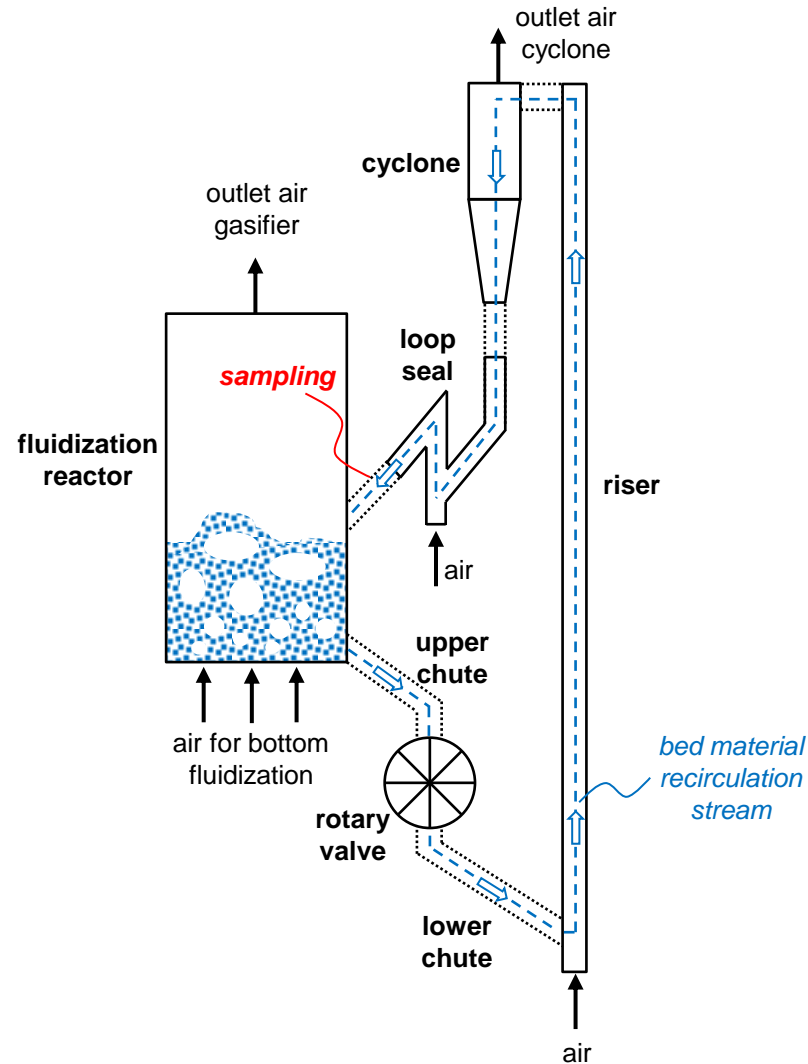
- same fluidization conditions as in DFB plant
- control the bed material recirculation stream
- sampling during operation  
→ determine char concentration

## ■ particle species

- bed material: bronze,  $d_p = 118 \mu\text{m}$
- char: polyethylene (PE),  $d_p = 3 \text{ mm}$



# Cold flow model. Operating principle

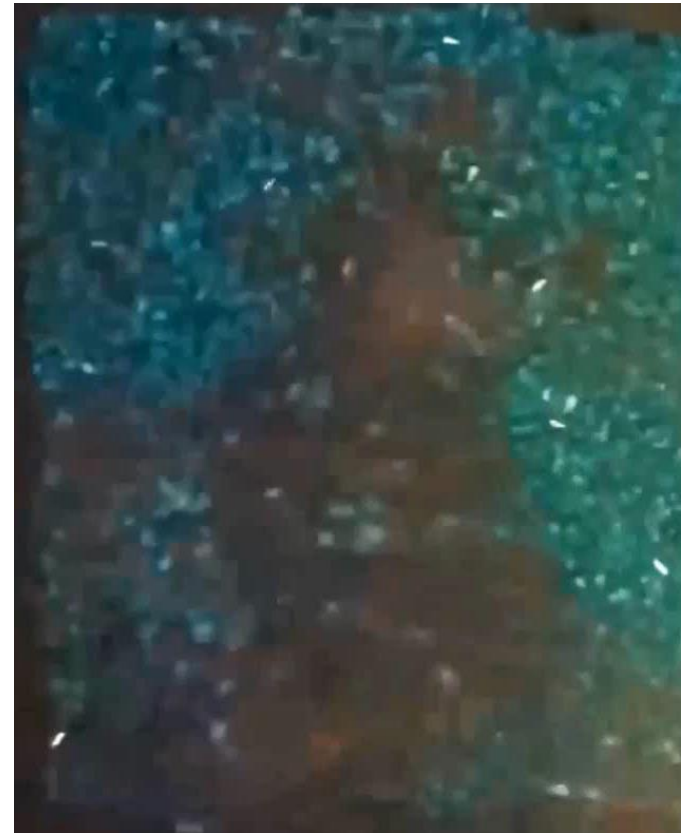


# Char concentration

**Quarzsand**

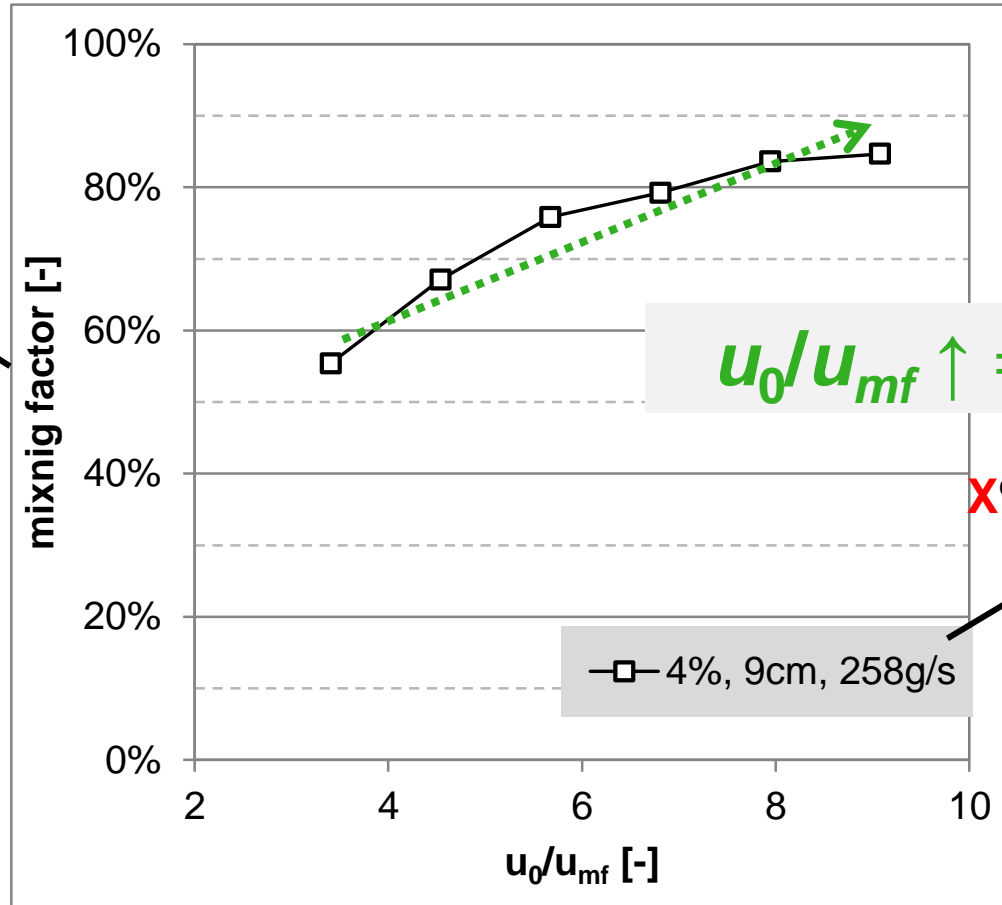


**Acrylic glass**



# Influence of fluidization rate

$$M = \frac{c_{char,sample}}{c_{char,system}}$$



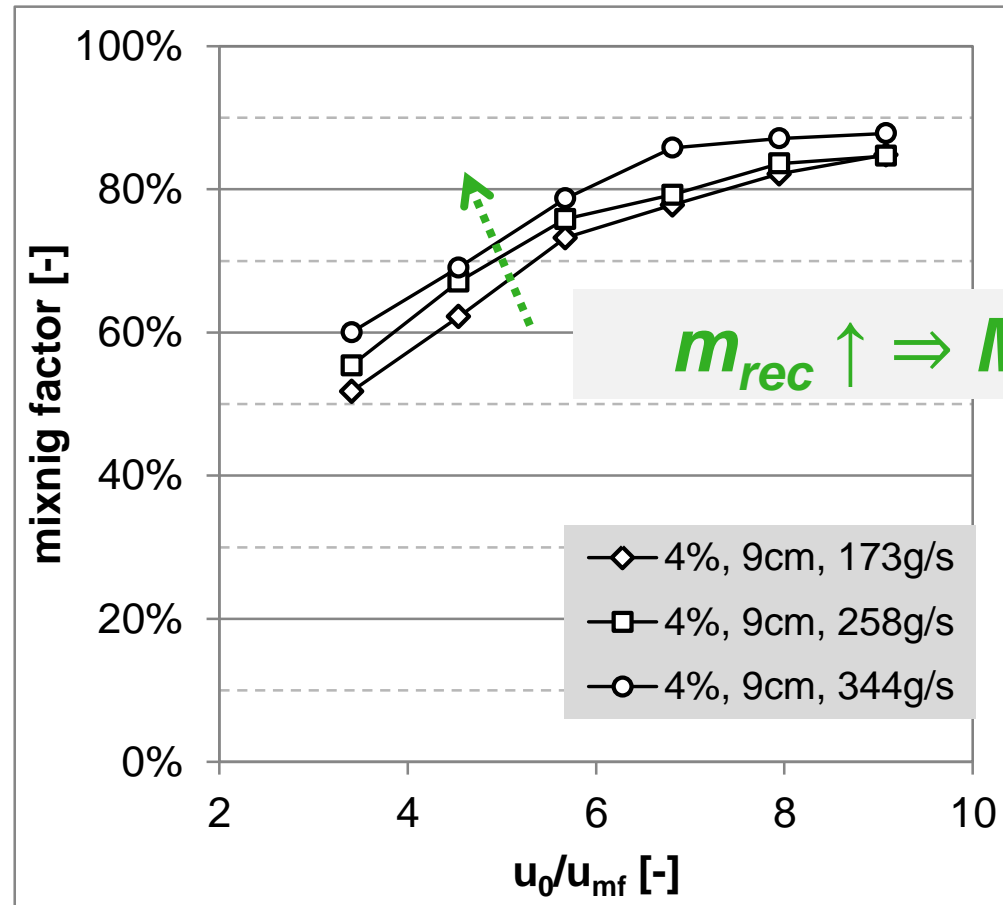
X% Ycm ZZZg/s

—□— 4%, 9cm, 258g/s

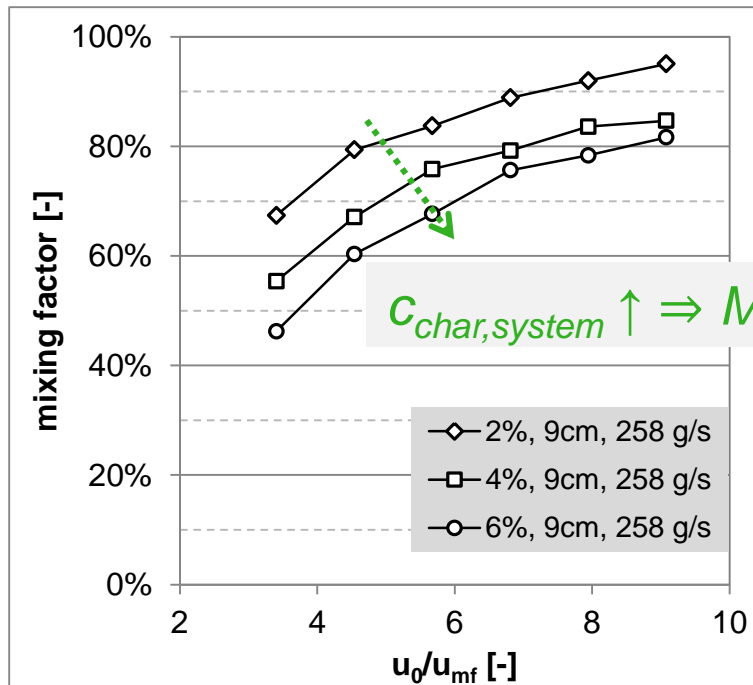
$u_0/u_{mf} \uparrow \Rightarrow M \uparrow$



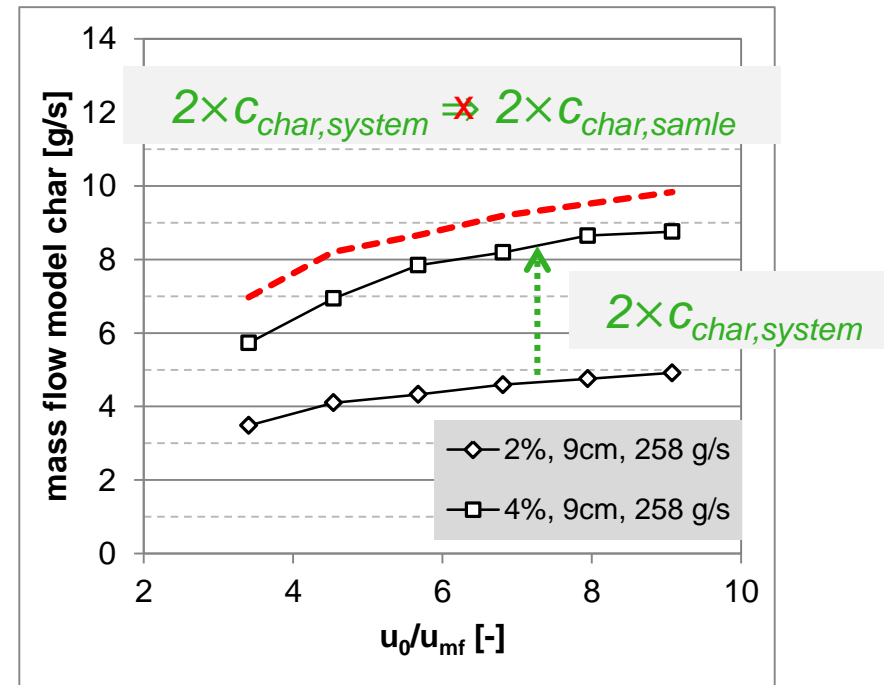
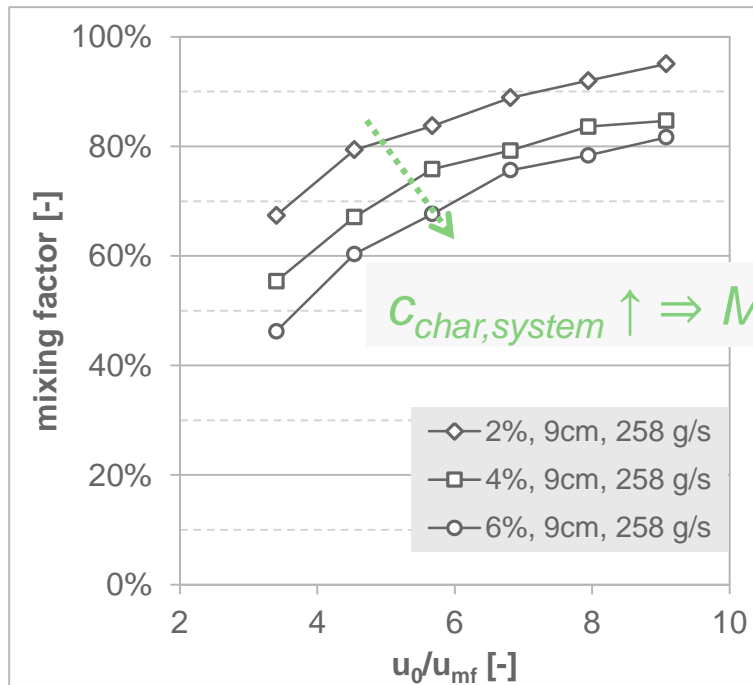
# Influence of recirculation rate



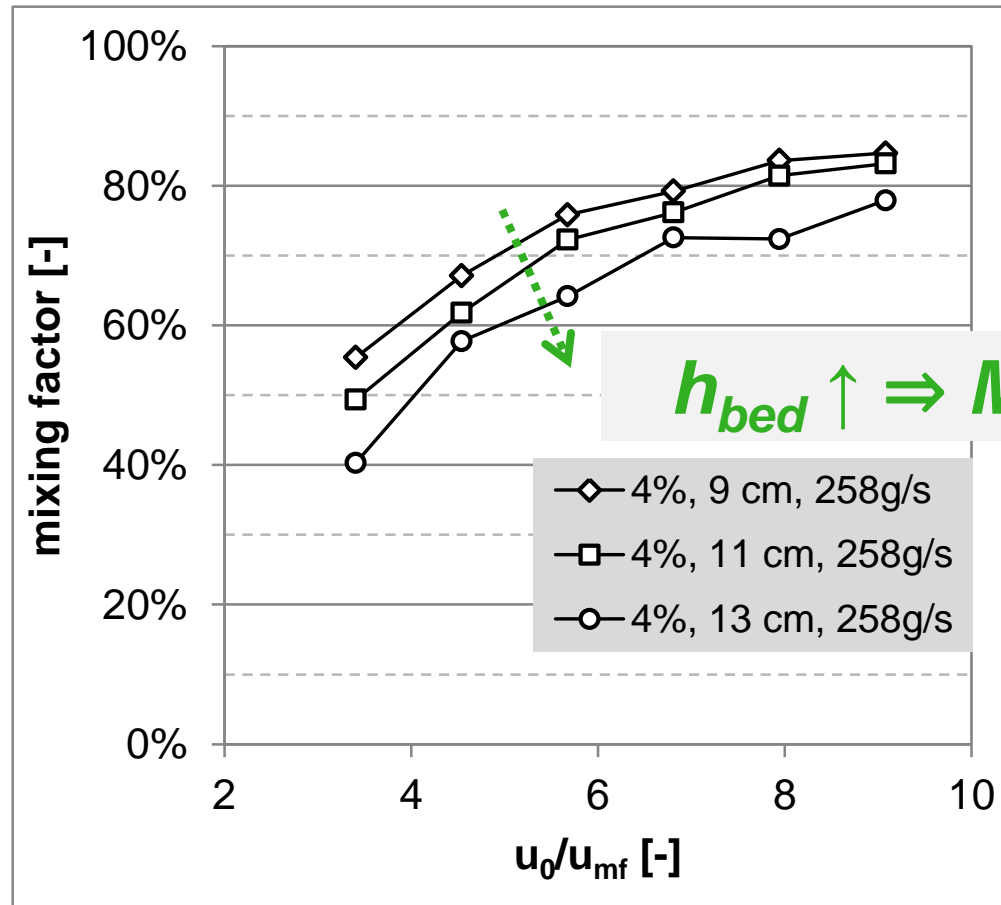
# Influence of char concentration



# Influence of char concentration



# Influence of bed height





## Summary and conclusion

- fluidization rate  $\uparrow \Rightarrow M \uparrow$
- bed material recirculation rate  $\uparrow \Rightarrow M \uparrow$
- overall char concentration in the system  $\uparrow \Rightarrow M \downarrow$
- doubling the char concentration in the system does not lead to a doubling of the char concentration in the recirculation stream
- bed height  $\uparrow \Rightarrow M \downarrow$



**Thank you  
for your attention!**

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