Raw material preparation in geopolymer production with special regards to the grinding

Ádám Rácz, Gábor Mucsi, Barnabás Csőke

University of Miskolc

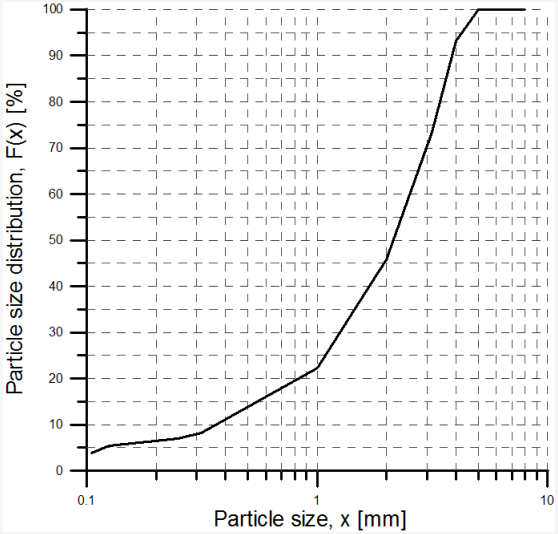
Institute of Raw Material Preparation and Environmental Process Engineering

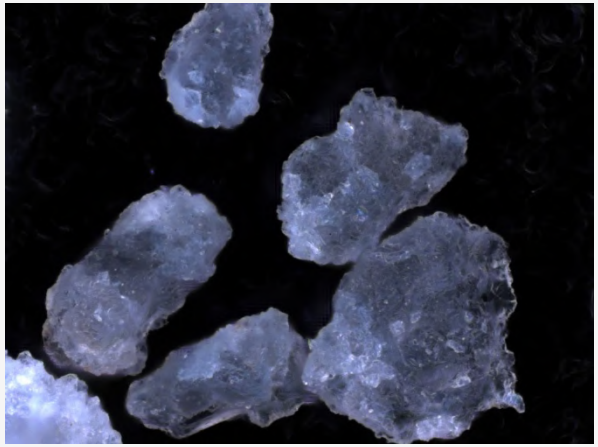
Content

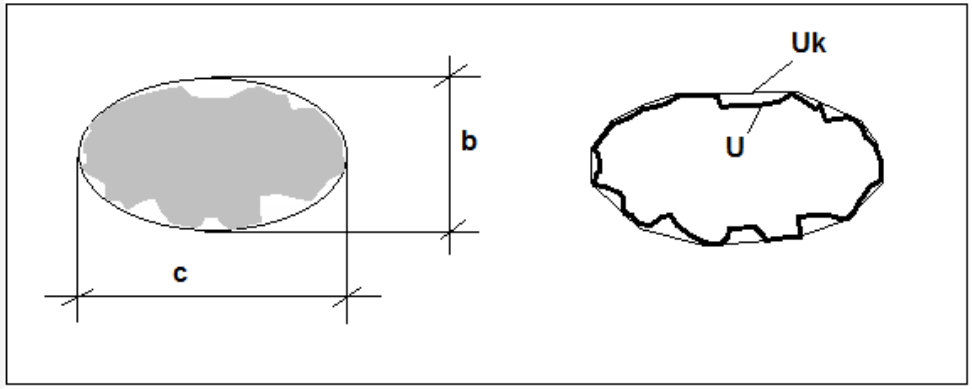
- Connection between the geopolymer and grinding
- Grinding equipments in the raw material preparation for geopolymer production

Grinding – Geopolymer

- Raw material of geopolymer: granular material with fine particle size
- Properties of the granular material:
  - Dispersity
    - Particle size distribution
    - Particle shape and morphology
    - Interfacial properties

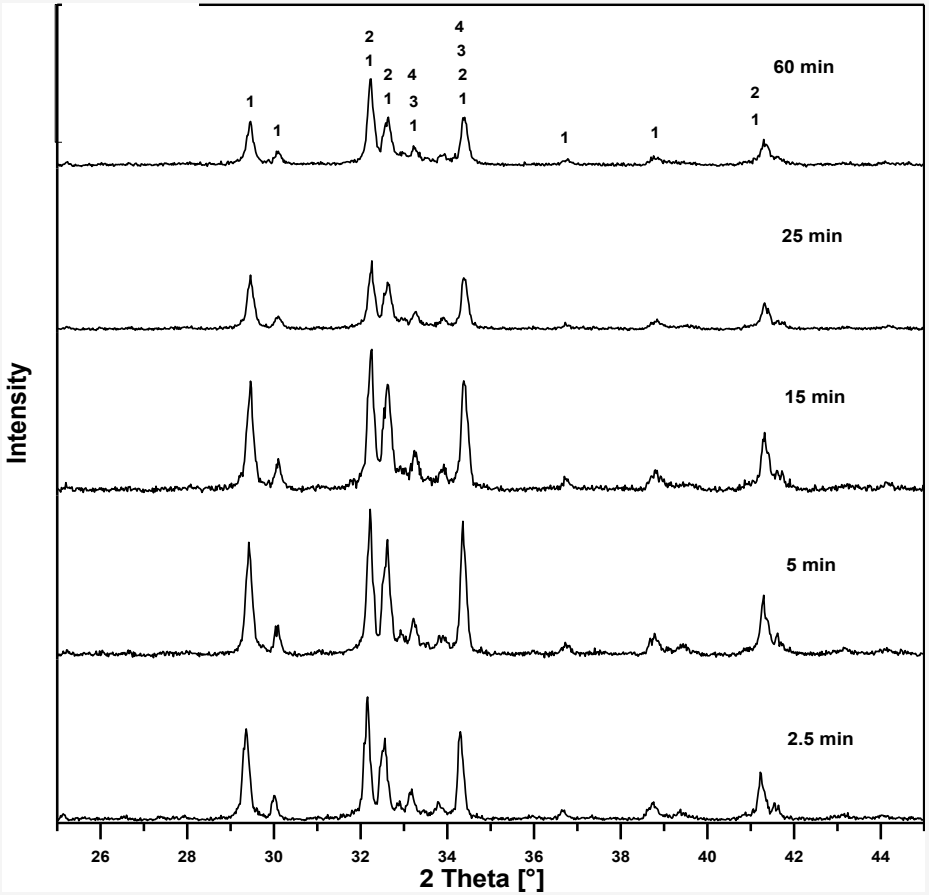






Grinding – Geopolymer

- Properties of the granular material
  - Structural properties
    - Crystal structure
    - Amorfity
    - Mechanochemical activity



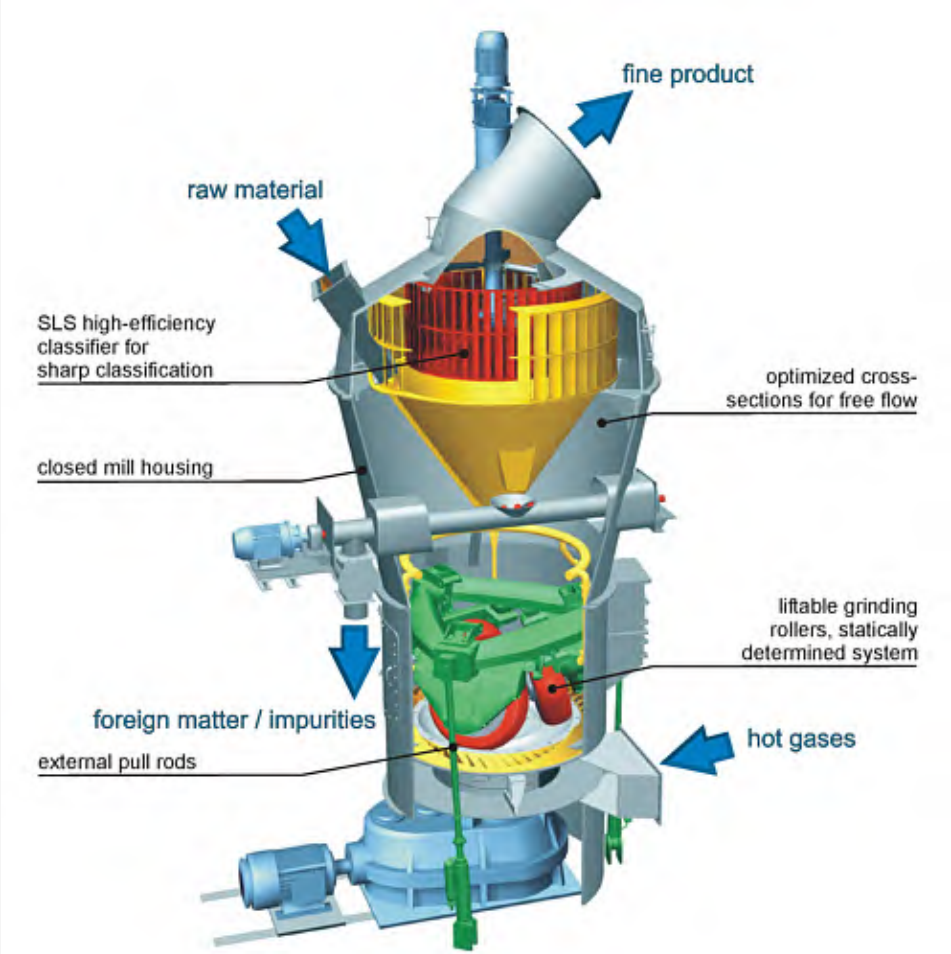
Main questions

- What are the best ground material properties (dispersity and structural) for the geopolymer production?

- What is the most appropriate grinding equipment and which grinding parameters are suitable to reach the appropriate dispersity status and structural properties?

Grinding equipments for raw material preparation

- Vertical roller mill

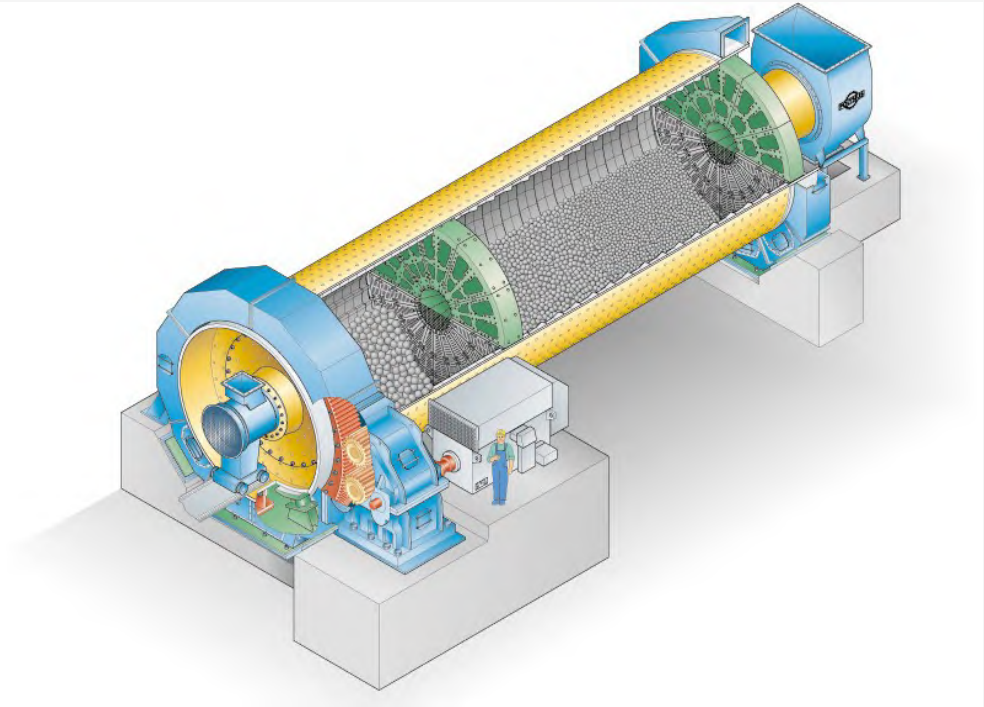


Grinding equipments for raw material preparation

- Traditional ball mill

  – Main operation parameters:

    - Ball filling ratio
    - Material filling ratio
    - Critical revolution ratio
    - Ball diameter and density
    - Grinding time

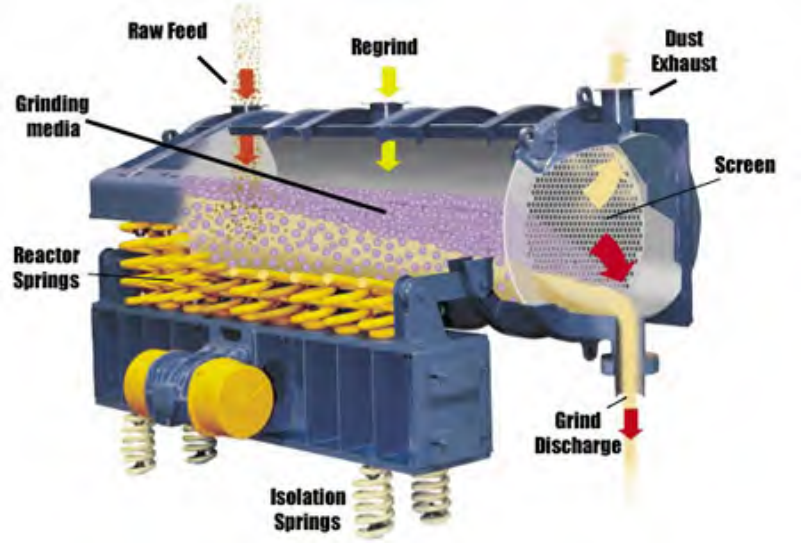


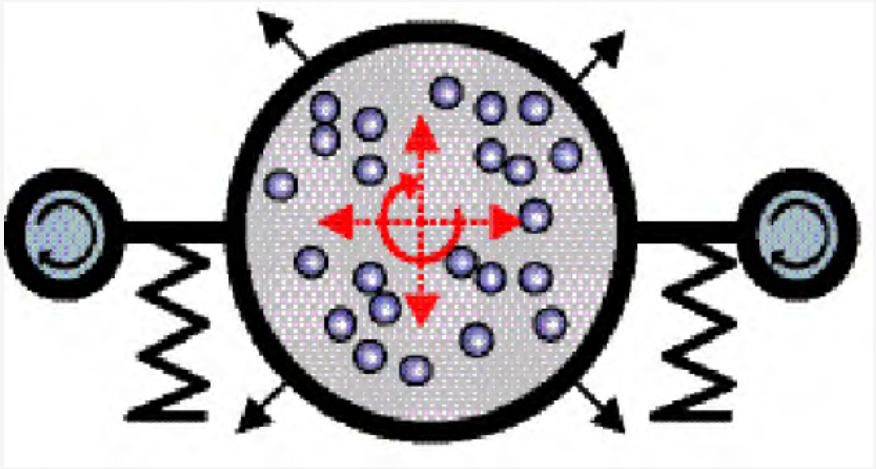
Grinding equipments for raw material preparation

- Vibration mill

Main operation parameters:

Grinding media filling ratio
Material filling ratio
Amplitude and frequency of vibration
Grinding media diameter and density
Grinding time



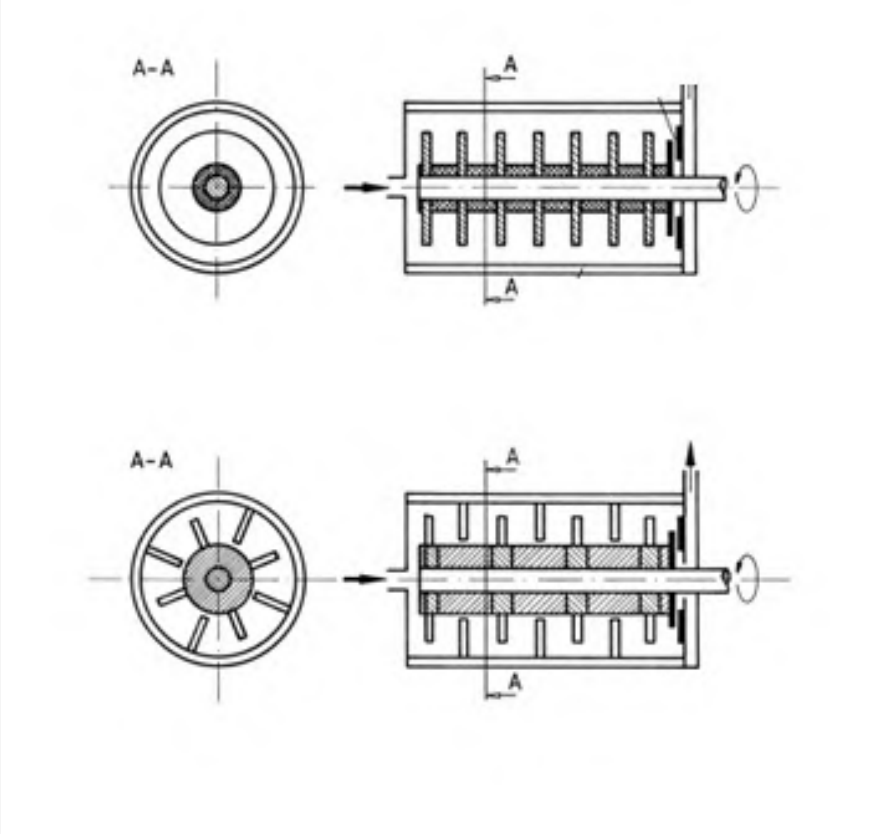


Grinding equipments for raw material preparation

- Stirred media mill

Main operation parameters:

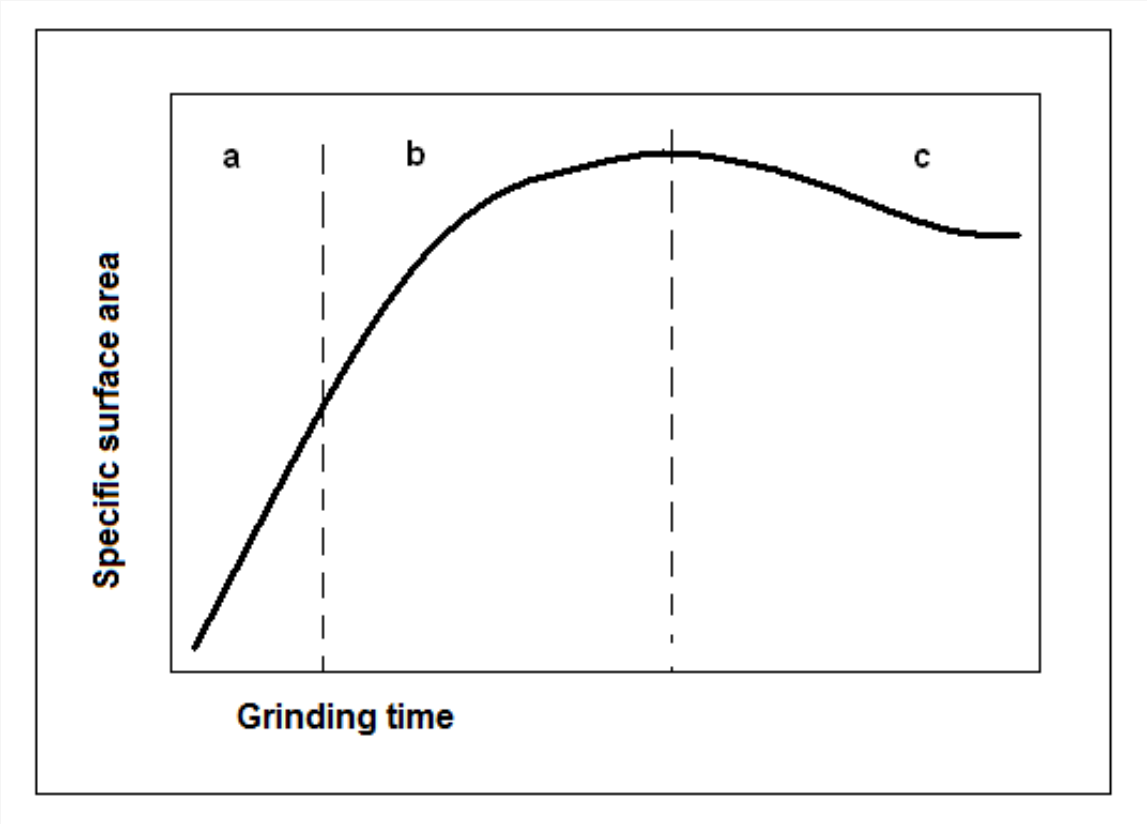
Grinding media filling ratio
Material filling ratio
Circumferential speed of the stirrers
Grinding media diameter and density
Grinding time



A. Kwade, Wet comminution in stirred media mills – research and its practical application, 1999, Powder Technology, Volume 105, Issues 1-3, 14-20.

Effect of grinding time – kinetics of the grinding process

- Section „a” - the specific surface area rises linearly with the grinding time (Rittinger section)
- Section „b” - the slope of the specific surface area decreases (section of aggregation)
- Section „c” - the specific surface area decreases with the grinding time, which can be explained by agglomeration.



Thank you for your attention!