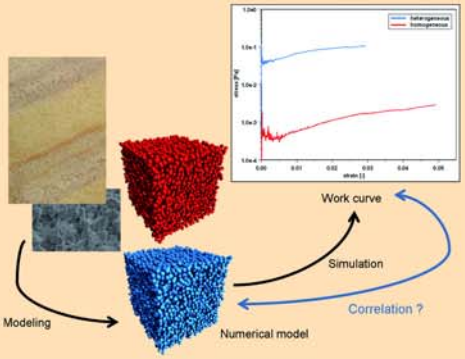
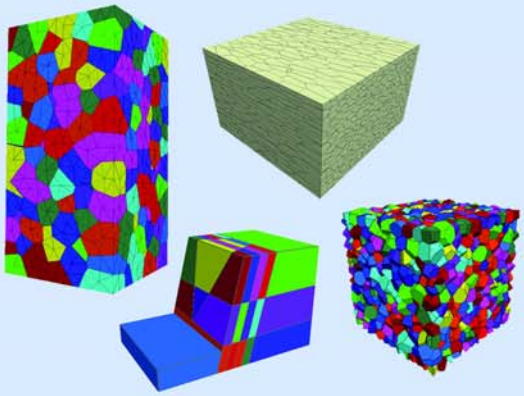


Why using analyzing methods?

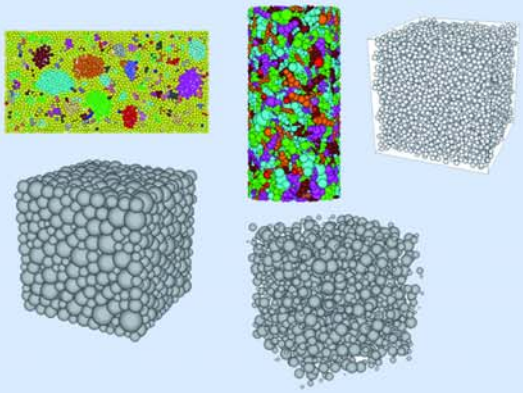
Numerical simulation technique is used in the field of engineering research for the reproduction of laboratory tests like compression or tensile tests. Not only the initial physical parameters affect the result of the simulation but also the numerical model itself, especially the spatial arrangement of the particles, can have great influence on the work curve.

The analysis tools offer a possibility to evaluate the numerical model in regard to its geometrical properties.

The basic elements of a 3DEC model are polyhedrons which are subdivided into zones. The zones can be deformable or undeformable. A 3DEC model has no porosity.



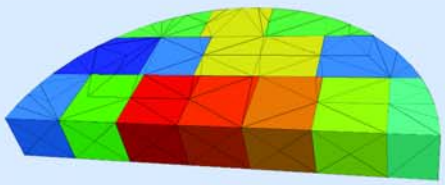
PFC3D models are built by spheres and walls which are both rigid. Every PFC3D model has porosity by nature.



Analyzing methods for polyhedron models

- Coordination number
- Number of faces of Laguerre cell
- Mean distance of each sphere to its neighbours
- Distribution of number of faces
- Diameter distribution
- Surface distribution
- Volume distribution of Laguerre cells

→ Information about structure, changes in structure



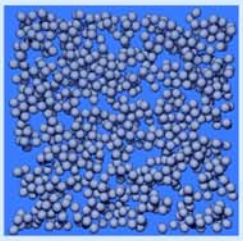
Analyzing methods for sphere models

Pore space:

- Linear contact distribution function
- Spherical contact distribution function
- Porosity

↓

Size, shape and distribution of pores



Particle configuration:

- Pair correlation function
- Ripley's K-Function
- Packing density

↓

Short-range and long-range order, tendency of forming clusters, force transmitting chains

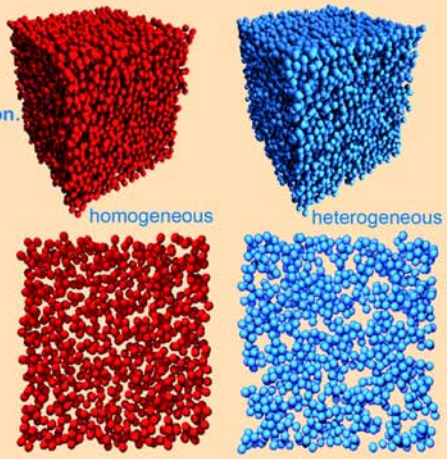
How to use? ..... Results for models „homogenous" and „heterogenous"

The pseudo-cutting planes belonging to the two sphere models of the above presented compression tests are shown. By this visual inspection first differences become obviously, both in pore space and the particle configuration. The results of the analysis methods confirm and quantify these results:

Contact distribution functions:
- heterogen has larger, roundish pores,
- homogen narrow and small pores

Pair correlation function and K-Function:
- heterogen: tendency of forming clusters, has more chains of two or three spheres,
- heterogen has additionally lots of pairs of two spheres with a tiny gap in between

→ under external strain gap is closed
→ heterogen has better properties to form force transmitting chains through the whole model
→ higher stability



Development of an analysis tool for assessing geometrical and physical properties of discrete-element-models

Prof. Dr.-Ing. habil. H. Konietzky; Dipl.-Math. Anett Wagner

Dr. Erich Krüger Foundation

DBE TECHNOLOGY GmbH

Geotechnical Institute
Geomechanics, rock mechanics/rock engineering

Tel. +49 3731 39-2519; Fax + 49 3731 39-3638
www. ifgt.tu-freiberg.de