



# PRODUCTION OF HIGH VALUE-ADDED MINERALS: GRAIN DESIGN

Particle design is a new field of science that studies the controllability of physical, physicochemical and chemical properties of particulate matter, such as shape, surface roughness, size distribution, composition, and surface characteristics. Preparation technologies used for particle design can improve the performance (e.g. solubility, reactivity, sorption, functionality) or properties (reduction of dusting, improvement of flow characteristics, anti-segregation stability, bulk density, recyclability) of materials, primarily as a result of mechanical process operations.



## SERVICES

### SHREDDING

- Crushing kinetics studies with 35 types of crushers in the size range 300 mm to 100 nm for mineral raw materials for the agricultural, food and pharmaceutical industries
- Development of shredding technologies
- Crushing and grindability tests to determine specific grinding work
- Increasing the size of shredding to laboratory or semi-industrial scale
- Nano grinding

### CUTTING

- Basic briquetting and pelleting tests
- Scaling up cutting operations
- Coating, production of special core-shell structures

### SEPARATION-MIXING

- Classification tests with sieves and air classifiers
- Enrichment tests with magnetic separators, eddy current device, air flow device
- Phase separation tests: filtration, sedimentation, centrifugation
- Production of different mixtures, examination of their homogenisation
- Sampling from material flows, material sets



## TOOLS

- Netzsch MiniCer nanomill (<100 nm)
- Horiba laser particle size analyser (10 nm to 3 mm)
- Netzsch fine sorter (2 to 8 µm)
- Retsch Technology Camsizer X2 camera particle size and shape analyser with dry (XJet) and wet (X-Flow) dispersing unit
- Freeman Technology FT4 Powder flow tester
- Micromeritics Gemini 2390t - BET specific surface measuring device
- Phenom ProX desktop scanning electron microscope
- Fritsch Pulverisette 5 Premium line high energy density planetary mill
- EDEM - DEM software for modelling particulate matter sets
- TAM AIR 3 isothermal calorimeter



## REFERENCES

- CriticEl project <http://kritikuselemek.uni-miskolc.hu/>
- RING2017 project <https://ring2017.uni-miskolc.hu/>
- COST Action "Mechanochemistry for Sustainable Industry" (Mech @ SustInd) CA18112 <https://www.mechsust-ind.eu/>
- Thematic Program of Excellence
- Higher Education Institutional Excellence Program