Enhanced Weathering of Slags

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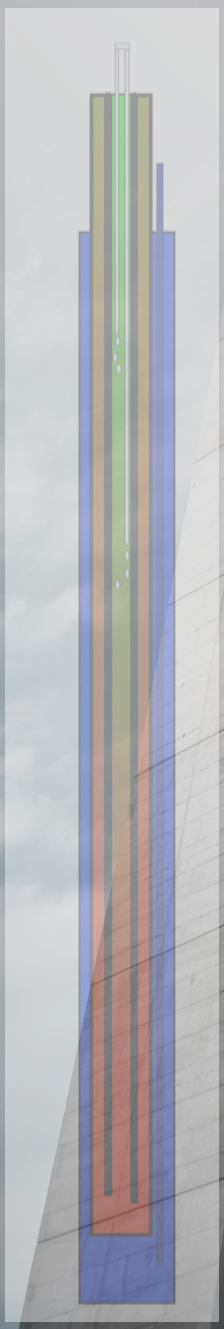
Novel reactor design for enhancing chemical reactions

Goal: Speed up slow kinetics, especially for mineralisation.
A drawback for enhancing reaction rates are the higher temperatures and pressures which needed. Typically for a faster reaction temperatures of about 200 degrees, pressure upto 100 bar are required.
Usually this can only be achieved with additional energy costs and mechanical problems.
The present invention achieves these conditions without these penalties.



Working principle:

Innovation Concepts is developing an unique reactor. This reactor is between 600 meter and 1200 meter long (deep). The reactor is a special type of a Gravity Pressure Vessel (GPV):
In this reactor:
-the pressure built up is performed by gravity (energy neutral).
  During the downflow increases the pressure, upward is the pressure released
- a very efficient heatexchanger is part of the design.
  Most of the energy is transferred from the outflowing liquid to the incoming material
  The three phase flow pattern takes care for a efficient heat transfer
- particle attrition for removal the passivating layers (by the intense three phase flow)
  The particles are constantly interacting (when required extra material can be added)

Applications

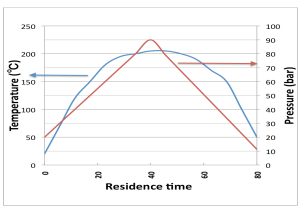
The process was originally developed for the treatment of liquid sewage sludge.
We are converting this technology for various applications:
- “CO2 Energy reactor ©” (for the sequestration of CO2 and the production of CO2 positive building materials)
- Accelerated weathering of slags
- Neutralisation of Red Mud (with the aid of CO2)
- Destruction of asbestos
- Various other uses

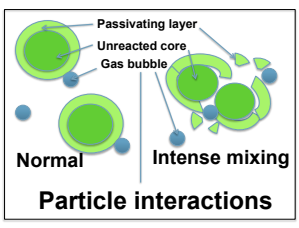
Results & Status:

Innovation Concepts has developed a simulation tool. Based on these process calculations is the reaction rate increased by 1 Million. This is partially by the increased temperature and by the increased pressure. The attrition (erosion) effect is not included as this is hard to simulate.

The next step is the development of a rocking autoclave. By this device the exact process conditions are created. (temperatur, pressure, residence time and the attrition effect).

The proceeding step is a continuous autoclave
And finally the full scale Gravity Pressure Vessel





Conclusions

- ✓ A novel reactor design
- ✓ Achieving high temperatures
- ✓ Achieves pressures
- ✓ **No energy penalty**
- ✓ **Intense mixing (and attrition)**
- ✓ Truly plug flow reactor
- ✓ Research required
- ✓ Various input streams possible

More information

More information can be found on:
www.innovationconcepts.eu
The lab-tests will start this summer.
A special designed autoclave will be used for this.

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