

The effect of solid volume fraction and filter cake thickness on the result of filtration using conventional filtration in case of Vietnam coal



200th WISE



Thanh Hai Pham

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Permeability ratio to investigate the appearance of cracks as well as to estimate degree of cracking

- For conventional filtration: Permeability ratio $\beta = k_G/k_L$

$$k_L = \frac{1}{r_c};$$

$$k_G = k_{Gm} = \frac{2(p \cdot \dot{V})_t \cdot \eta_G \cdot h}{A \cdot (p_1^2 - p_2^2)} \text{ in case of dewatering without cracking}$$

$$k_G = \frac{k_{Gm}}{k_{Grl}} \text{ in case of cracking;}$$

- For steam pressure filtration: Permeability ratio $\beta = k_{ST}/k_L$

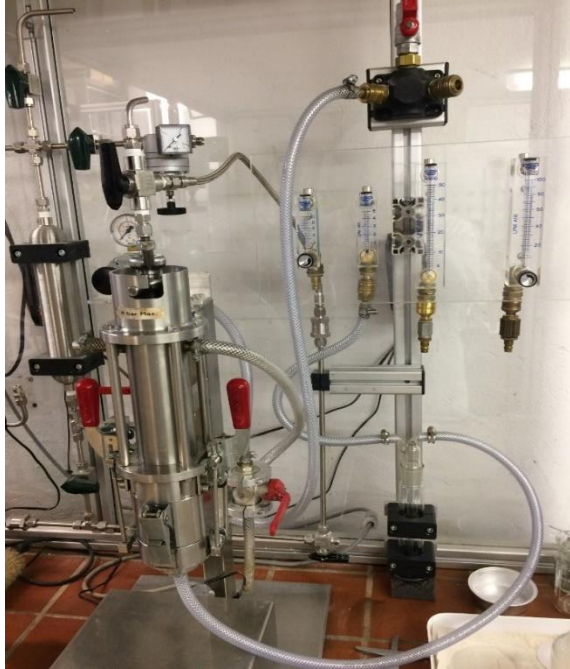
$$k_L = \frac{1}{r_c}; \quad k_{STm} = \frac{2 \cdot p_2 \cdot \dot{V}_2 \cdot \eta_{ST} \cdot h}{A \cdot (p_1^2 - p_2^2)}$$

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Characteristic of limestone (Particle size distribution and shape of KS100 (coarse material) and KS12 (fine material))

The effect of solid volume fraction and height of filter cake on crack formation in case of limestone. Tests were conducted in conventional pressure filtration and steam pressure filtration

Coventional pressure filtration

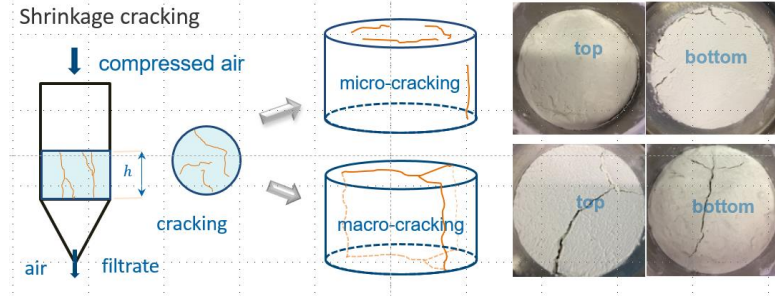


Steam pressure filtration

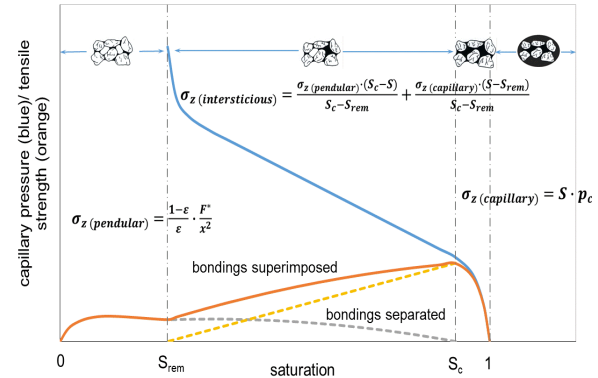


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Micro and macro cracking description

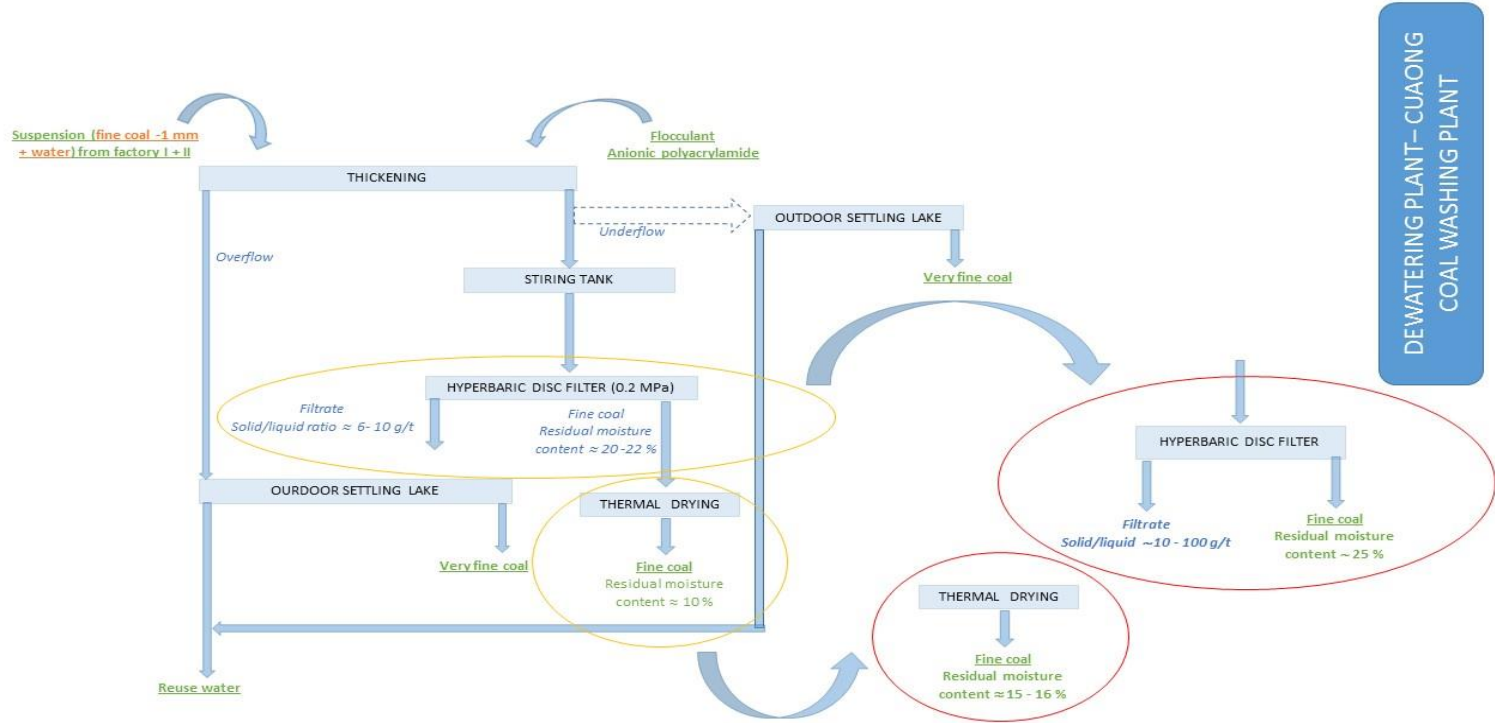


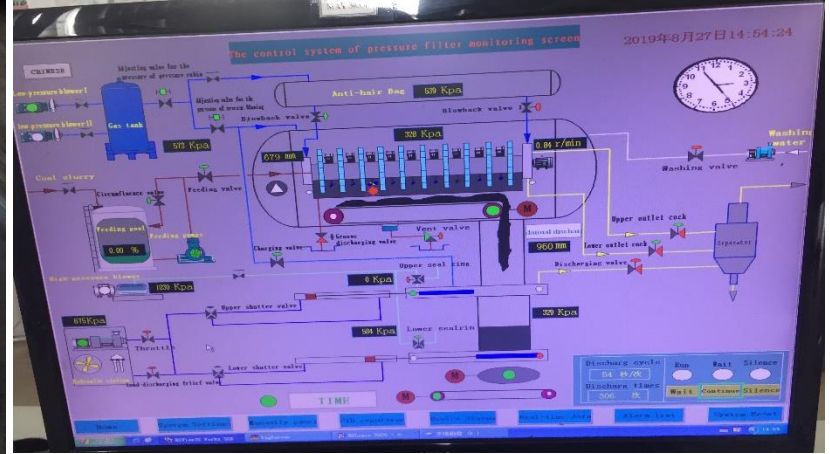
The relationship between tensile stress and saturation of filter cake.



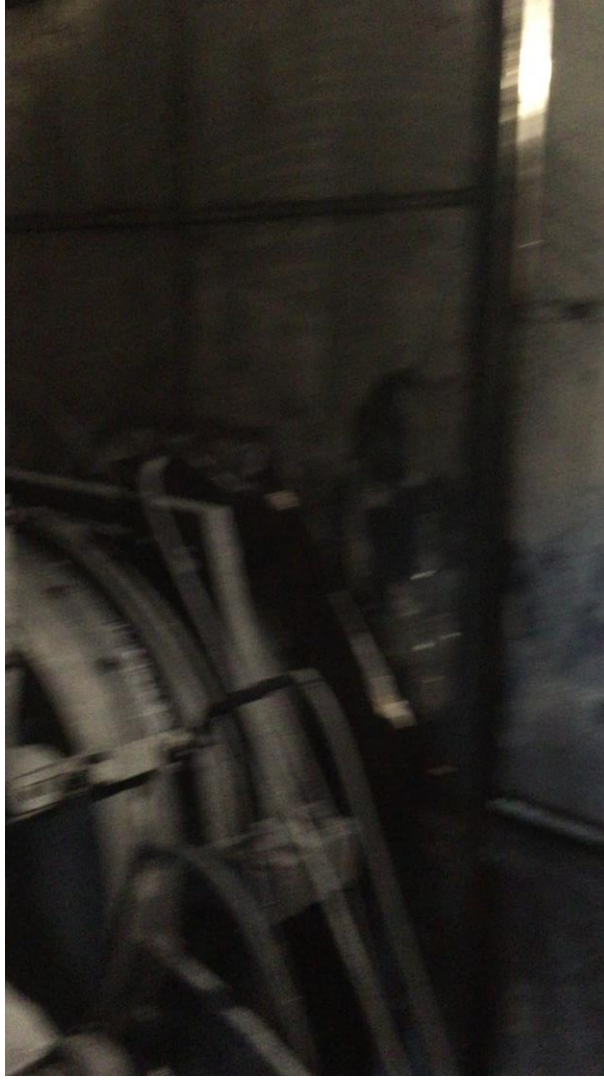
Vietnam coal Cuaong washing coal plant

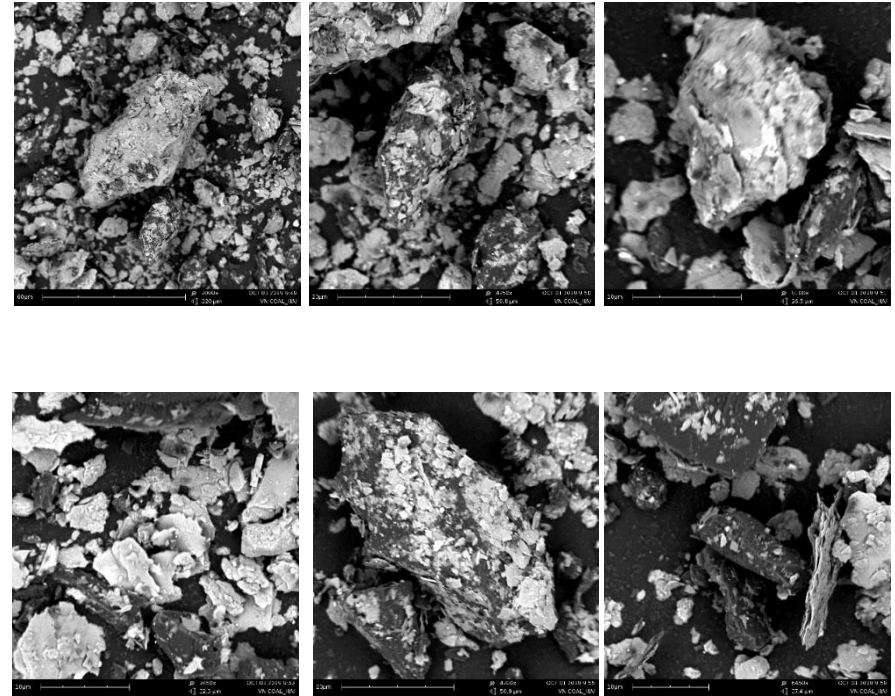
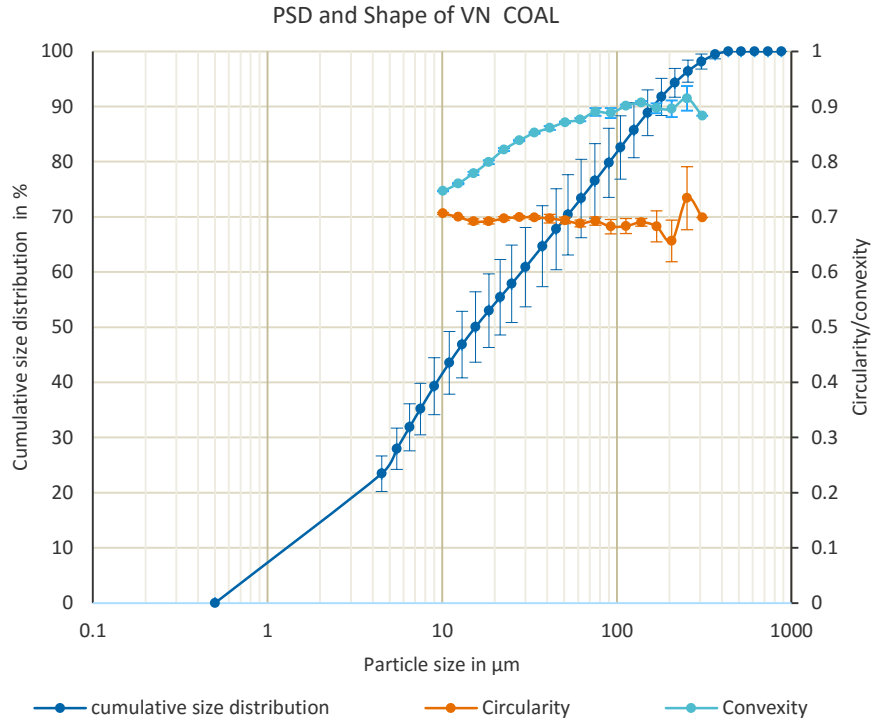


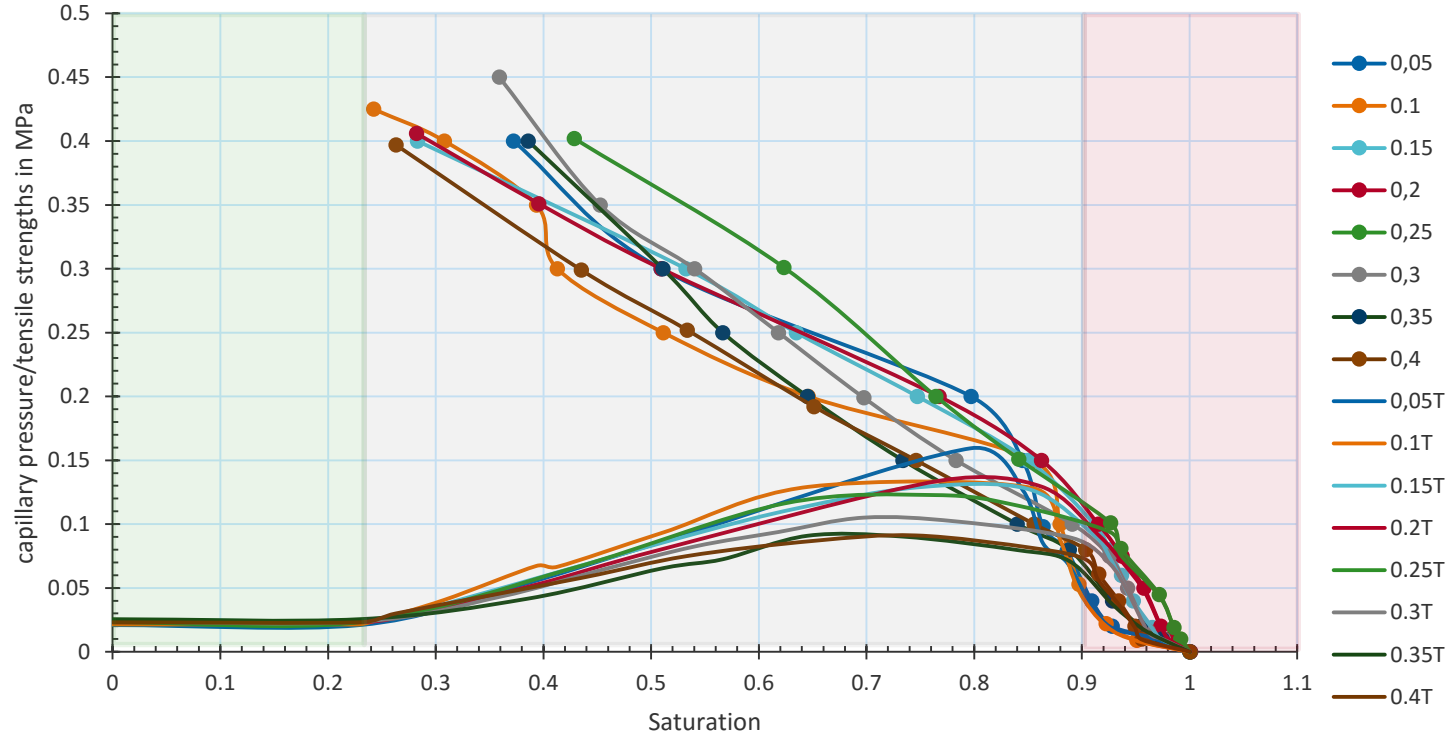


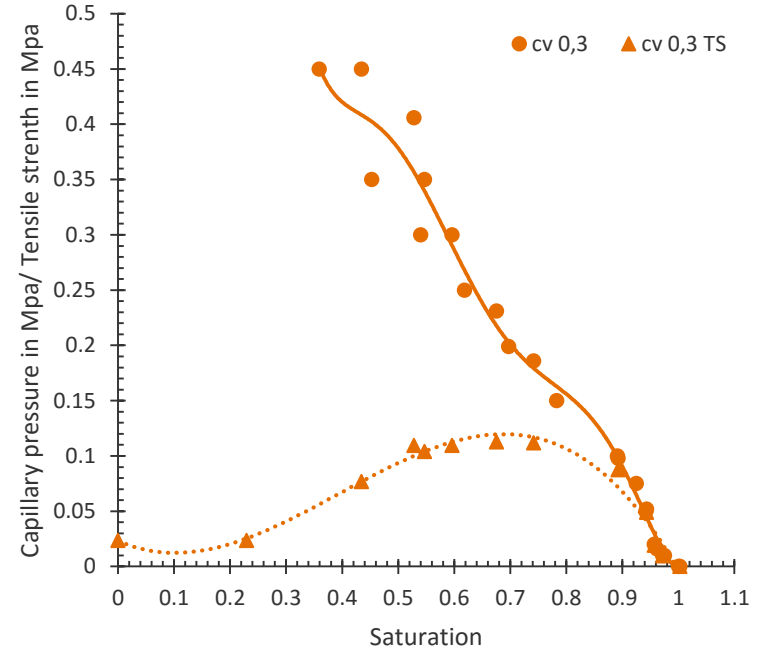
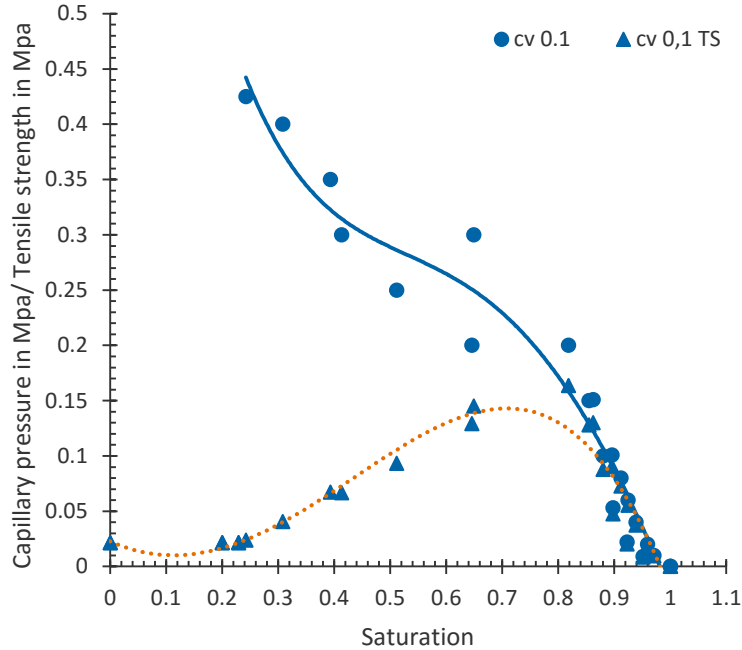


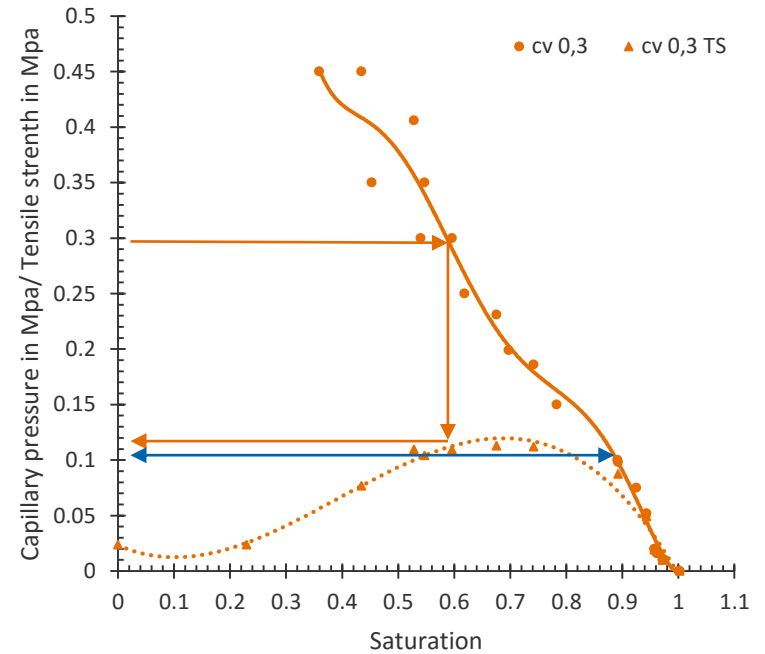
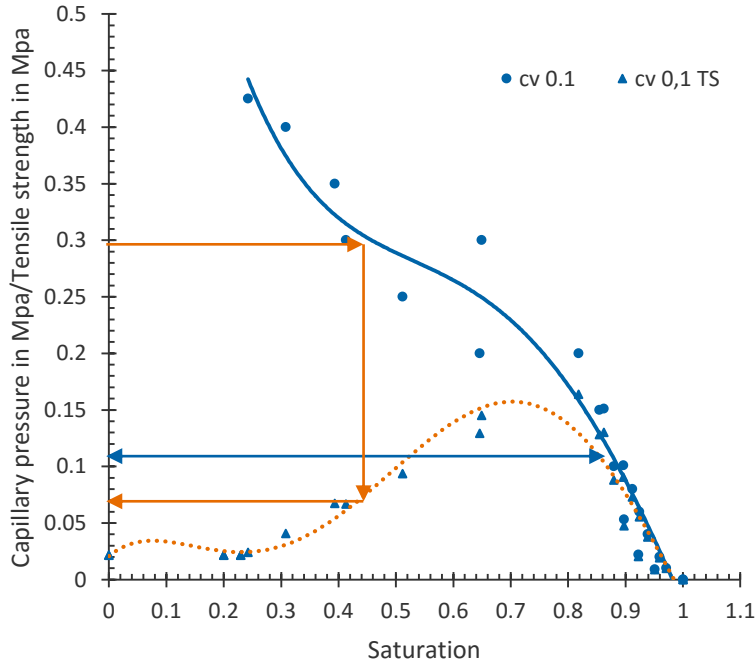




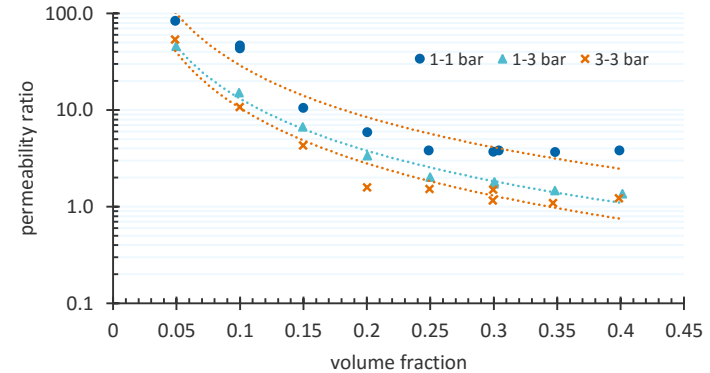
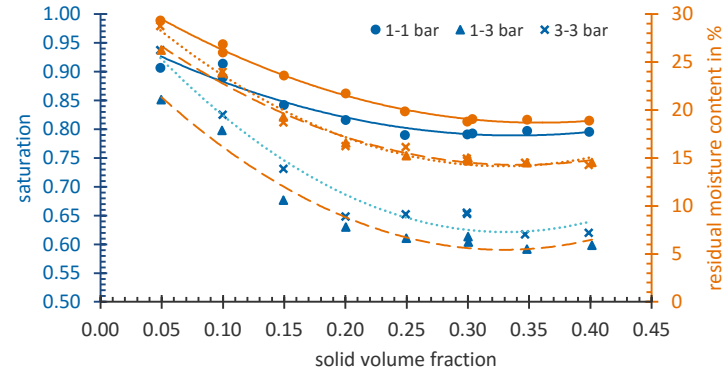
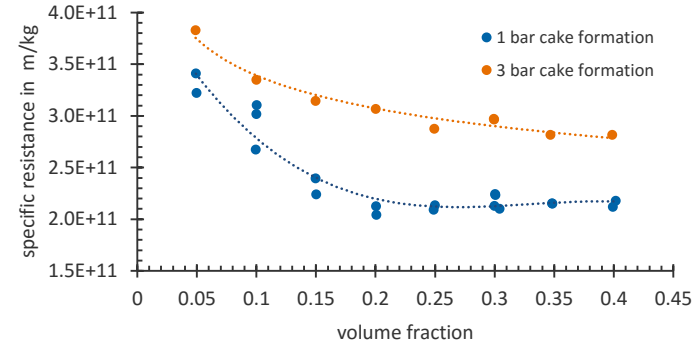
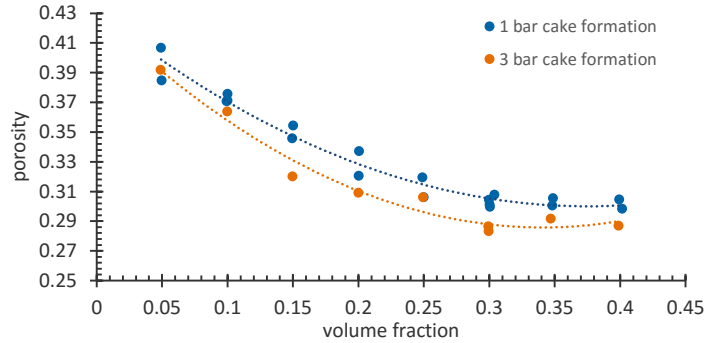




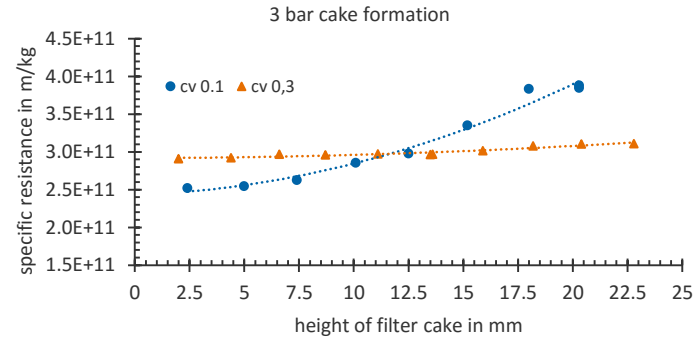
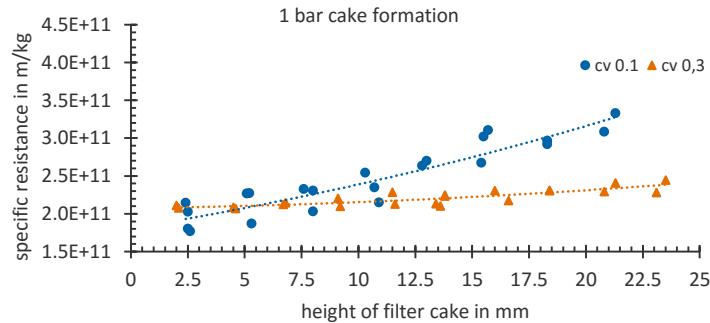
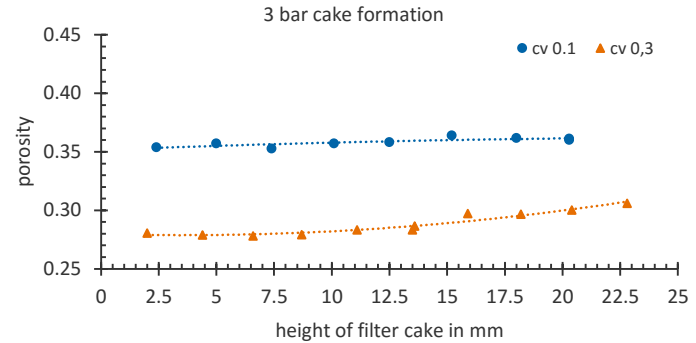
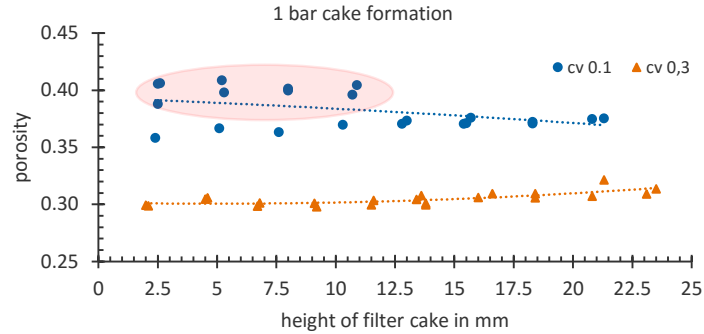


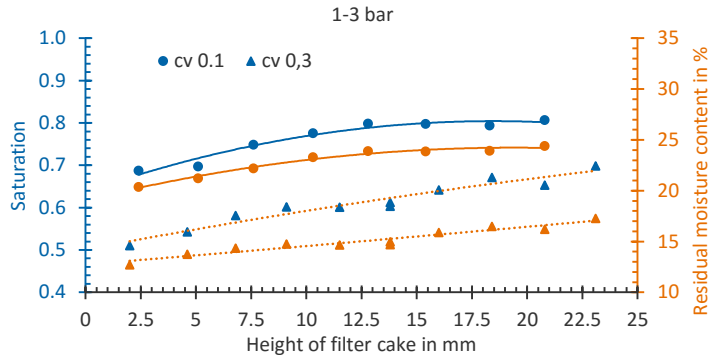
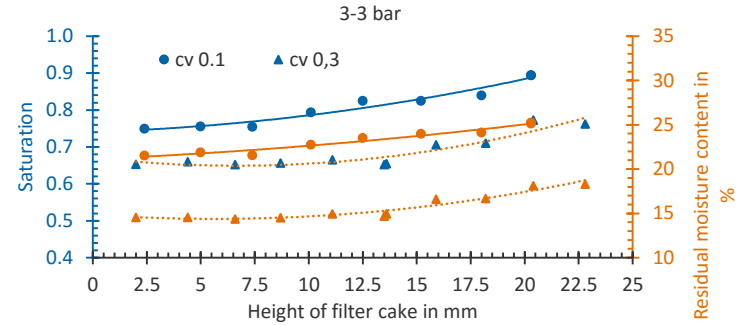
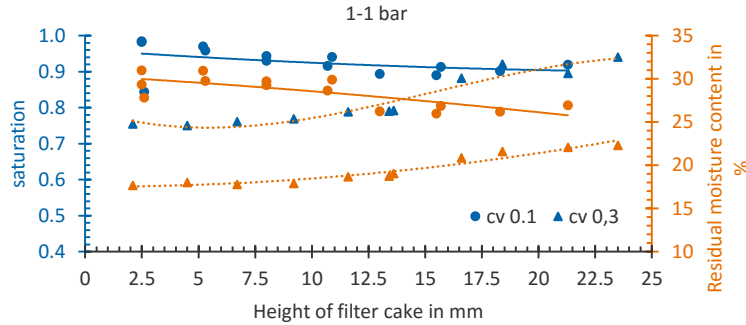


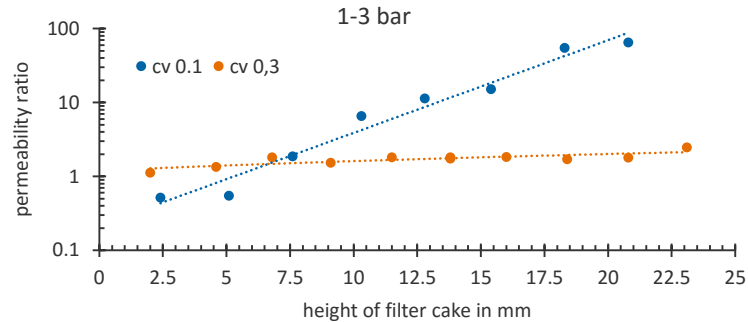
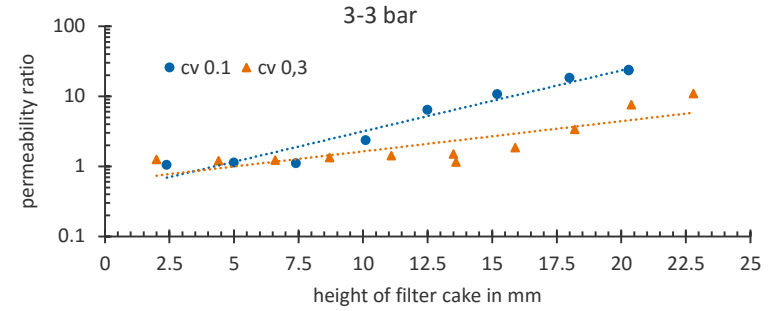
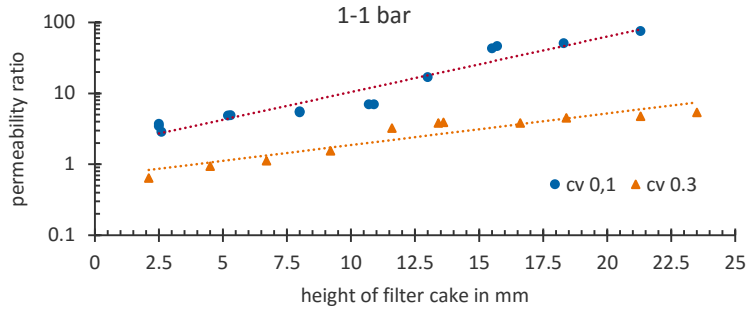
The influence of volume concentration of solid on filtration's result



The influence of height of filter cake on filtration's result







Discussion

For the influence of solid volume fraction

- ✓ The lower volume fraction of solid lead to the high residual moisture content as well as the high shrinkage on filter cake (the value of permeability ratio is also high)
- ✓ From 0.3 of cv, the effect of filtration are highest and stable
- ✓ The result show the negative impact of sedimentation to filtration
- ✓ Increase the pressure difference in deliquoring phase or both cake formation and deliquoring phase is one of the measurement to reduce shrinkage as well as imprve dewatering efficiency

Discussion

For the influence of height of filter cake

- ✓ Higher filter cake lead to higher sedimentation (both porosity, specific resistance are increase). However, the degree of sedimentation depend on volume fraction (cv 0.1 vs cv 0.3)
- ✓ Generally, both parameters are stable with lower filter cake (up to 12.5 mm) before increase significantly.
- ✓ For dilute suspension: lower filter cake is recommendation. For homogeneous filter cake (high cv): the height of filter cake can be increase

Discussion

- Permeability ratio is the good output parameters to quantify the degree of shrinkage and cracking;
- The reason for cracking and shrinkage may be:
 - Tensile stress of particles in filter cake (macro-. microcracking, shrinkage)
 - **The sedimentation (shrinkage, higher residual moisture content)**
 - Agglomeration of fine grain part (micro-cracking, shrinkage)
 - Wall size friction (micro-cracking, shrinkage)
 - The transferability of stress to filter cloth (micro-cracking, shrinkage)

Next time

- ✓ PSD measurement top and bottom of filter cakes to have more reference about sedimentation,
- ✓ Coal filtration test using steam pressure filtration (volume fraction and filter cake height)
- ✓ Compare the result with limestone
- ✓ Collect data, analyse and write down PhD Thesis

Thank you for your attention!
Danke für Ihre Aufmerksamkeit!

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