



**Materials
Processing
Institute**



TATA STEEL

Direct observation of swelling coal particles

Ian Moore

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EPSRC

Engineering and Physical Sciences
Research Council

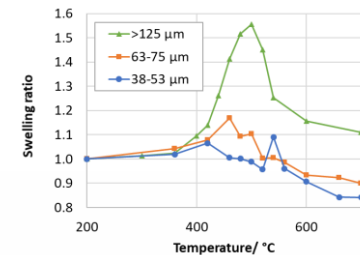
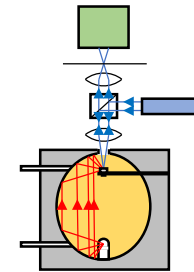
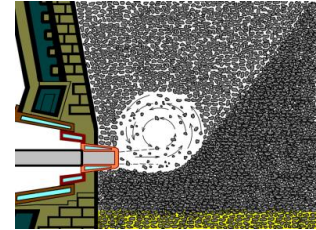
Contributors

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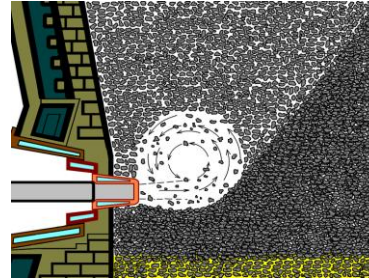
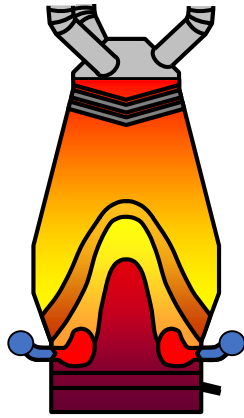
- a) Warwick Manufacturing Group
- b) Materials Processing Institute
- c) Tata Steel
- d) Colorado School of Mines

Content

- Coal properties important for steel industry
- HT-CSLM is novel technique to measure coal swelling
- Particle size appears to affect swelling



Context of work



Global
steel
industry



Blast
furnace
ironmaking

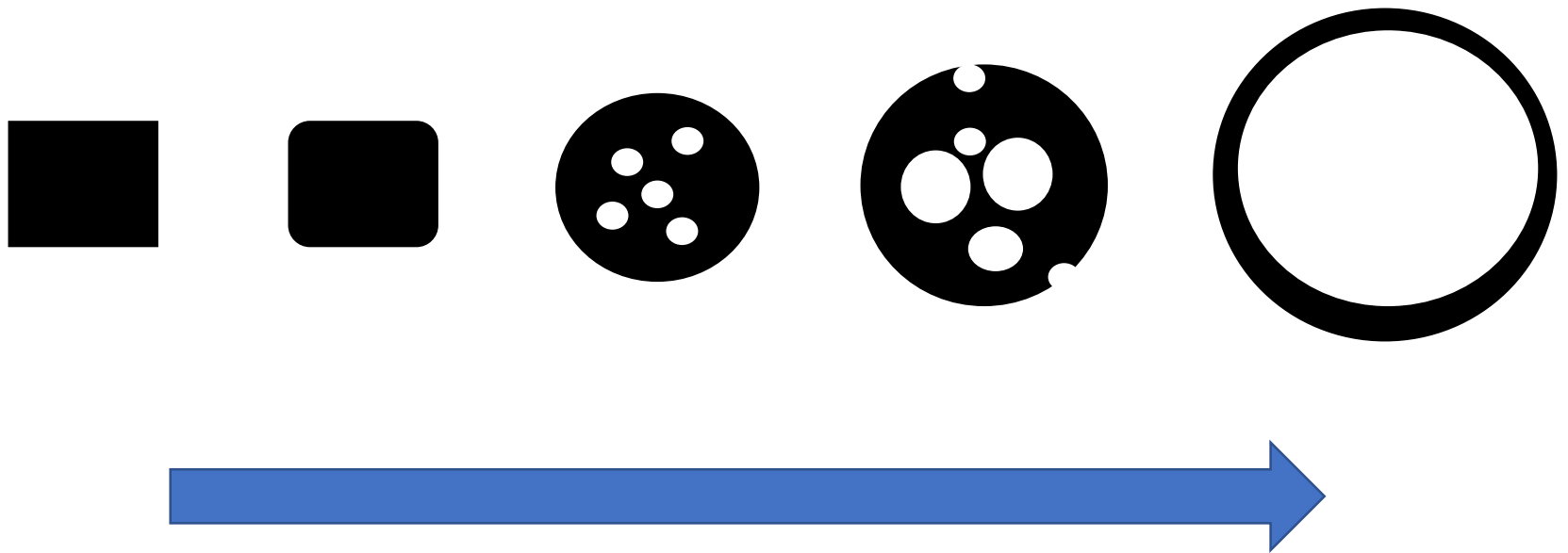


Pulverised
coal
injection

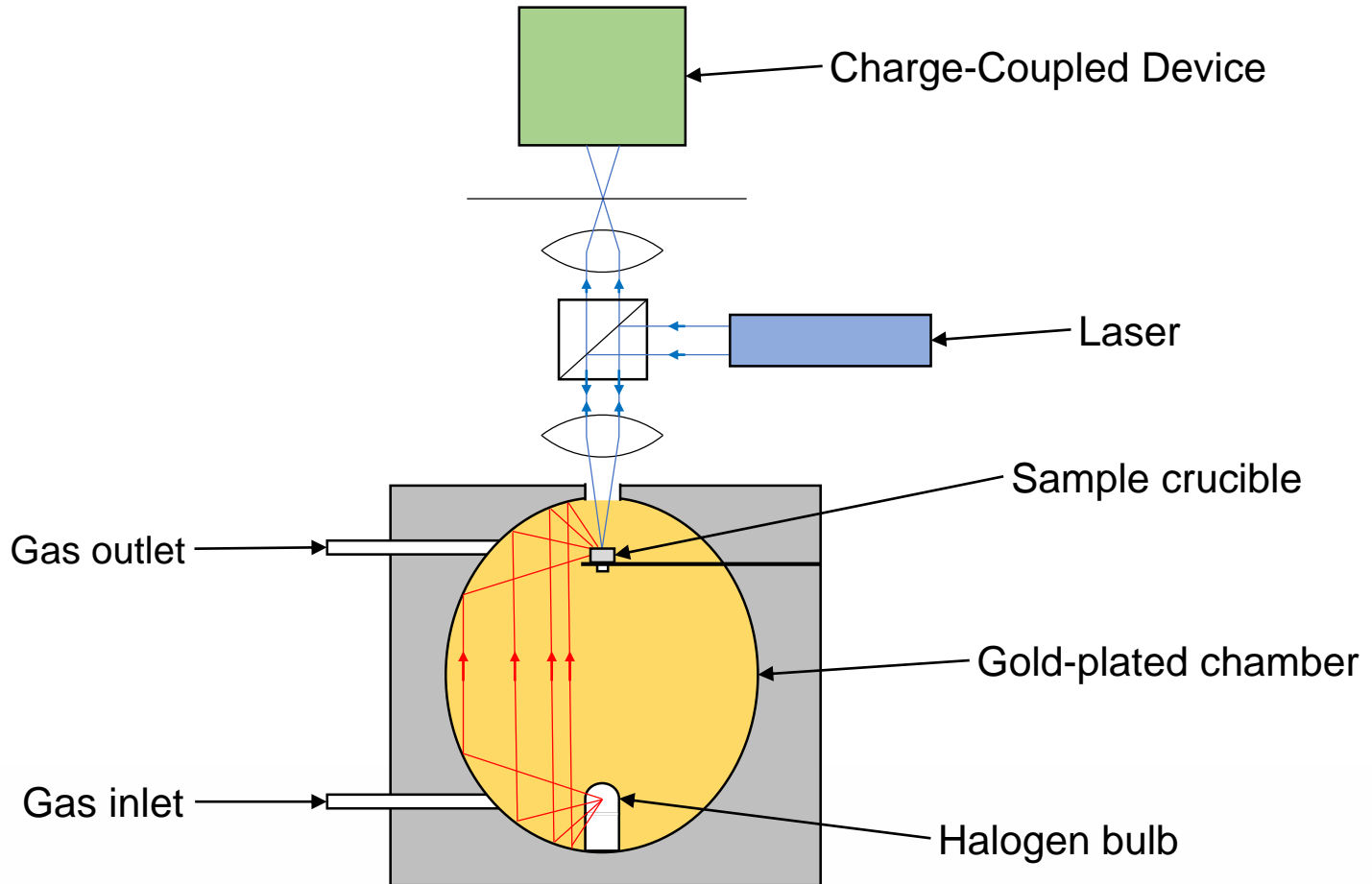


Coal, the
raw material

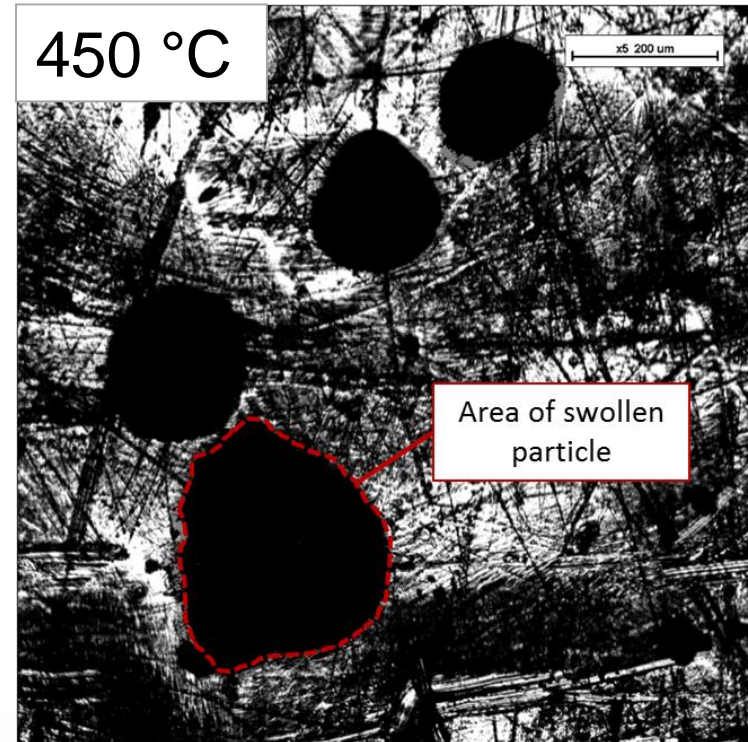
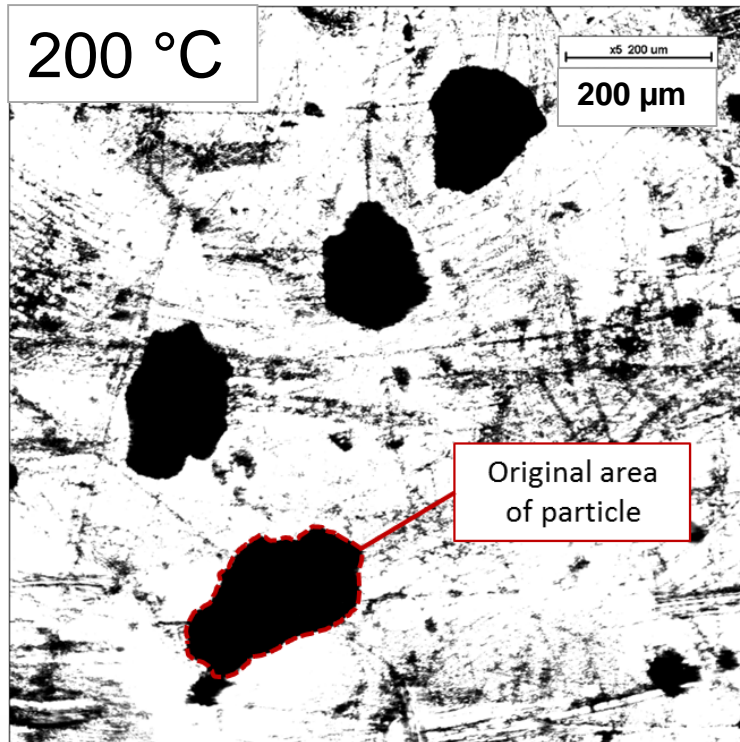
Coal particle swelling



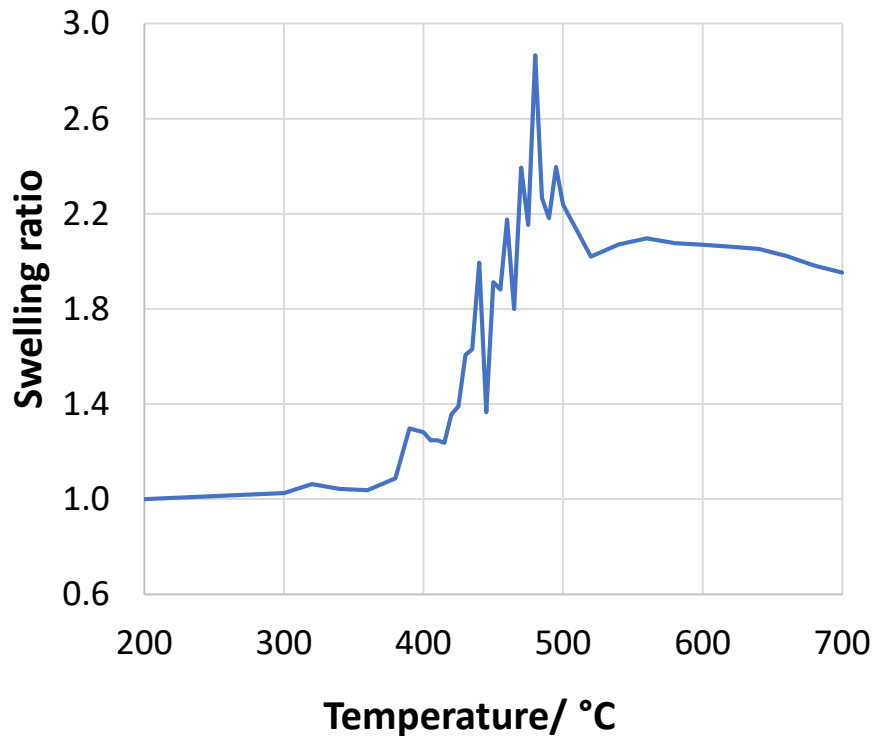
High Temperature Confocal Scanning Laser Microscope



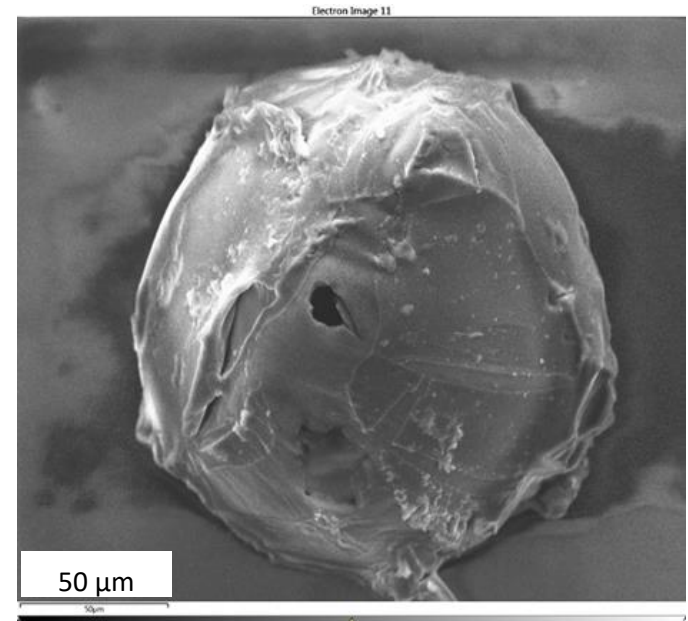
Images from confocal microscope



Single particle swelling profile

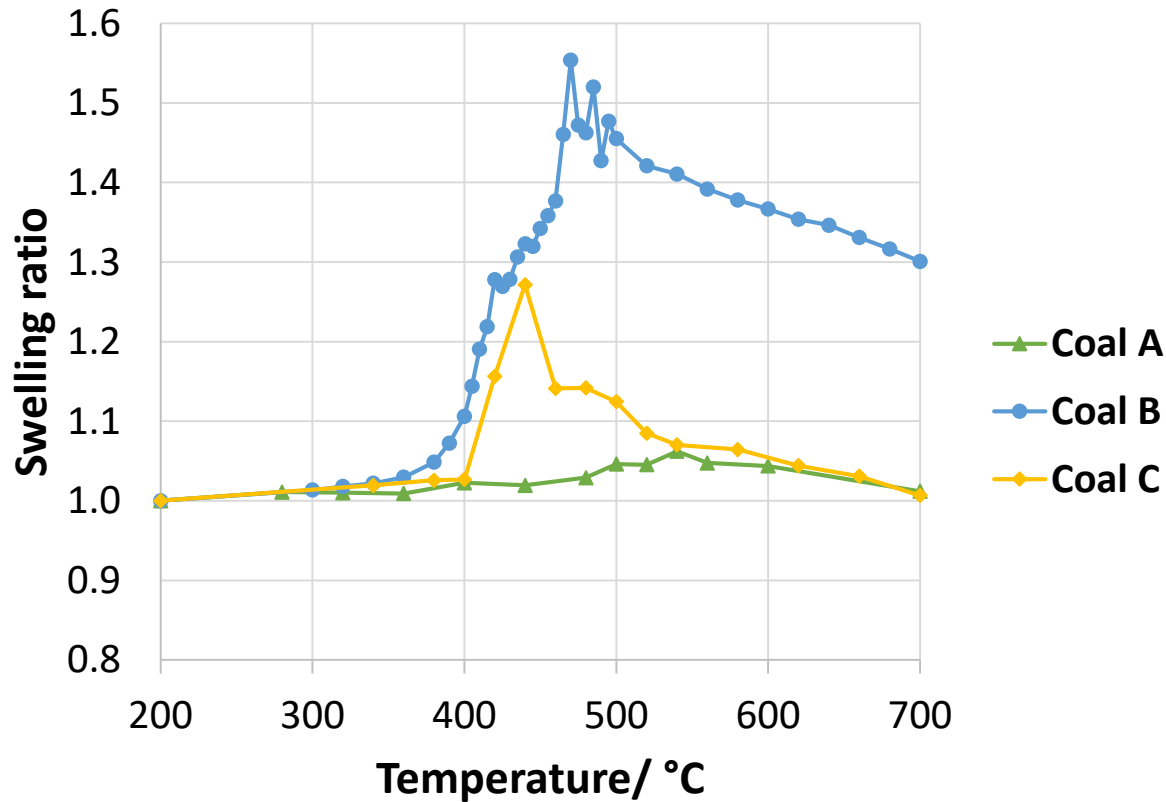


The swelling profile of a single coal particle heated at 700 K/min in the HT-CSLM.



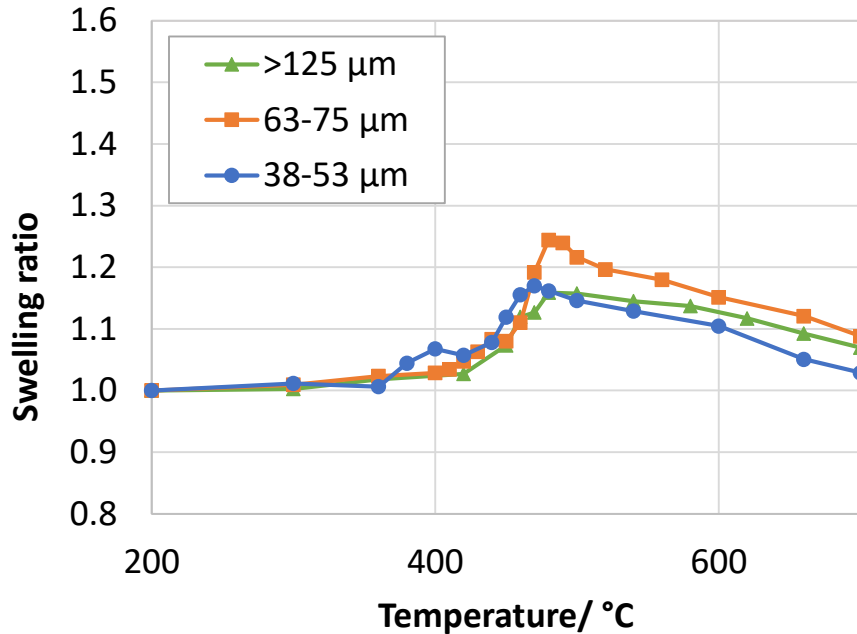
SEM image of swollen coal particle quenched at 450 °C

Differentiation between coal types

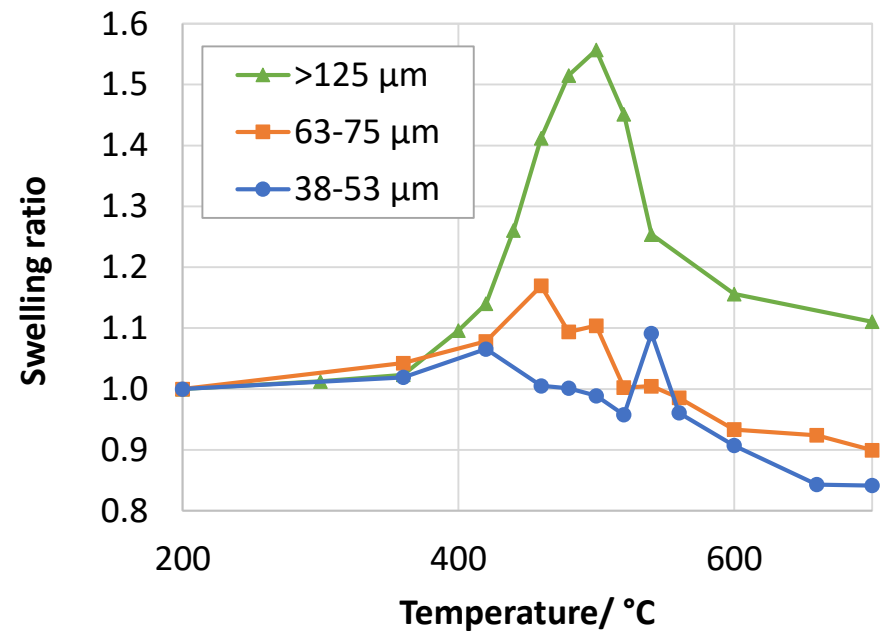


Effect of particle size

Coal A

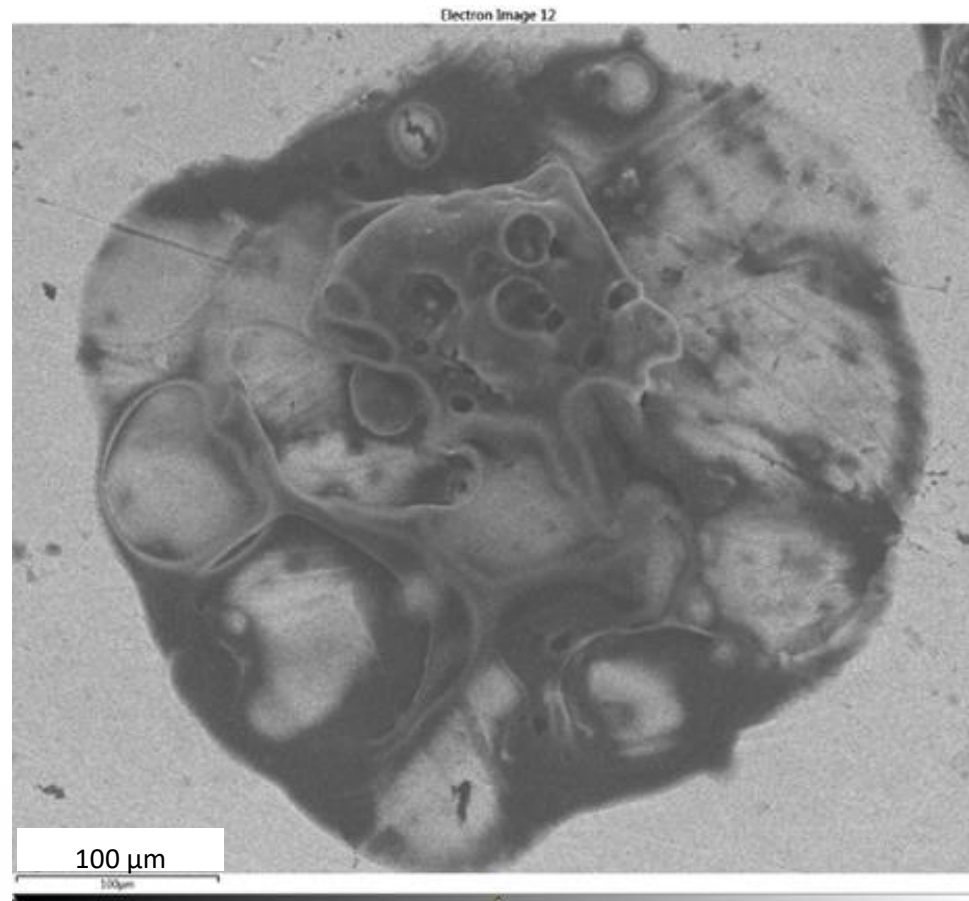


Coal B



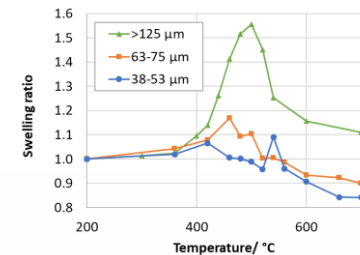
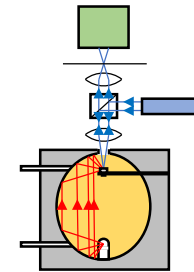
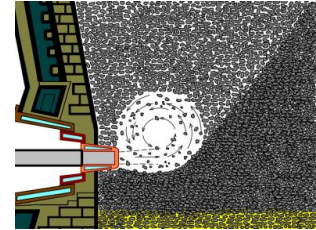
Mean swelling ratio of size fractions of coals A and B within the density range S1.2-F1.3.

When a particle is too fluid



Summary

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- HT-CSLM is novel technique to measure coal swelling
- Particle size appears to affect swelling



Thank You

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