Introduction
- Pulverised coal is injected into the blast furnace raceway via the tuyere to reduce the demand for coke (Carpenter, 2006).
- During this process coal particles may swell to a much larger size (Yu et al. 2003).
- This work aims to further our understanding of the coal particle swelling process and how this may impact upon Blast Furnace performance.

Measurement of Particle Swelling
- The High Temperature Confocal Scanning Laser Microscope (HT-CSLM) allows videos of swelling coal particles to be captured as they are heated at specified heating rates (up to 700 K/min) in a controlled atmosphere.
- Image analysis techniques enable the change in size of individual particles to be measured against temperature.

Results
- • Left: Effect of heating rate on swelling ratio for +125 µm particles of Coal B. • Increasing heating rate from 50 K/min to 700 K/min increases swelling ratio.
- • Attributed to increased volatile matter yield and rate of release. At lower heating rates gas can escape before internal pressure builds up. (Gale et al., 1995)

- • Left: Effect of particle size on swelling ratio of +125 µm particles of Coal B heated at 700 K/min.
- • Lighter particles swell more than denser particles.
- • Lighter particles generally have more vitrinite and less mineral matter, therefore enhanced thermo-plastic properties. (Yu et al., 2003)

- • Left: Effect of particle size on swelling ratio for S1.2-F1.3 particles of Coal B heated at 700 K/min.
- • Larger particles swell more than smaller particles.
- • Larger particles enable a greater build-up of internal pressure and have enhanced thermo-plasticity.

- • Left: Effect of coal type on swelling ratio of +125 µm particles of three coals heated at 700 K/min.
- • Some coals swell more than others.
- • Different coals have different thermo-plastic properties due to geological age and provincialism. (Gao et al., 1997)