Quantification of Microstructural Damage in Asphalt

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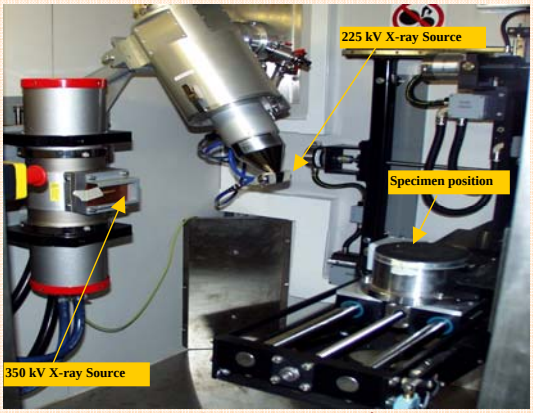
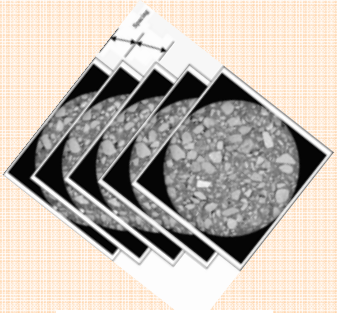
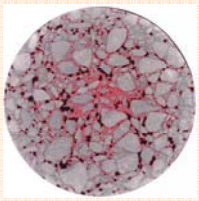
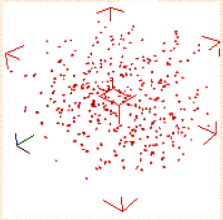


X- ray Computer Tomography

Instron testing Machine







X- ray Scanning, 2D and 3D Image Analysis

Asphalt is a complex multiphase material comprising bitumen, graded aggregate and air. Under repeated loading in the laboratory it is typically observed that the stiffness of the sample can reduce significantly without any sign of visible damage. This indicates that internal damage is developing at the micro-scale which ultimately develops into macro-cracking and failure of the sample. With recent advances in X-Ray computed tomography (CT), it is now possible to non-destructively internally inspect samples down to sub-millimetre resolution.

The aim of this project is to quantify microstructural damage growth in asphalt materials and relate this to deterioration in macro-properties (e.g. stiffness).

A range of repeated loading experiments will be undertaken to induce micro-damage. Samples are then scanned in the X-Ray CT and differences in the microstructure will be quantified and related to changes in macro-properties. A range of different asphalt mixtures will be tested over a range of conditions (stress conditions, temperature, loading rates etc).

The main deliverables from the project will be:

- Development of a technique to quantify micro-structural damage in the asphalt.
- Improved understanding of the internal damage growth mechanism for asphalt.
- A relationship between internal damage growth and the change in macro- properties such as stiffness.

The project is expected to be completed by October, 2008.

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