

# Review Subtask 2-4: Low-Temperature Properties

Fundamental Properties and  
Advanced Models ETG

2/28/08 Tampa, FL

# Work to Date

## Asphalt Characterization

- (M)DSC has proven to be a useful tool to evaluate low temperature properties of asphalt.
- Glass transition behavior shows good correlation with BBR stiffness.
- Curve fitting of the heat capacity may allow distinction of various asphalt components so the effects of aging on individual components may be measured.

# Year Two Work Plan

## Asphalt Characterization

- Continue MDSC measurements on asphalt and asphalt components.
- Perform curve-fitting on heat capacity of asphalt and asphalt component blends to validate the premise that this technique can be used to detect individual components.

# Work to Date

## Aging Influence

- Original, RTFO and RTFO/PAV aged asphalts show modest differences in DSC.
- The heat capacities can be curve-fitted with two normal distributions.
- Aging dominantly affects the higher temperature distribution, not the lower.
- The temperature at which the normalized heat capacity reaches 25% correlates well with mix IDT.

# Year Two Work Plan

## Aging Influence

- Ruggedness testing will be done to optimize MDSC methodology.
- Cooling rates will be varied to study steric hardening. NMR will also be used to measure low temperature relaxation.
- Isothermal aging in the MDSC will be used to monitor changes in the heat capacity curve as functions of time and temperature.

# Comments

- Will the aging test results be used to develop a kinetic model of asphalt aging?
- TSRST work has shown that stress can have a significant influence on steric hardening. Is there any way this can be included in the program?
- Will these aging tests allow identification of chemical and rheological properties that define block cracking?

# Review Subtask 2-3: Nanotechnology

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# Work to Date

- Recent work includes spin casting blends of asphalt with low MW polystyrene to reduce nucleation of asphaltenes and waxes.
- Initial work on determining adhesion properties by water soaking.
- Equipment upgrades include indentation testing, improved measurement and a hot/cold stage (-40 to +150 C)

# Year Two Work Plan

- Determine effects of oxidation for evaluation of asphalt/RAP interaction.
- Evaluate indentation to measure stiffness and creep relaxation.
- Use hot/cold stage (-40 to 60 C)
- Correlate AFM observations with rheological and thermal properties.

# Comments

- Explain Polystyrene blend rationale
- Bring morphological connection between spin cast film and hot melt.