International Association of Chinese Infrastructure Professionals

Study on temperature adjusting performance of asphalt mixture containing dual phase change materials

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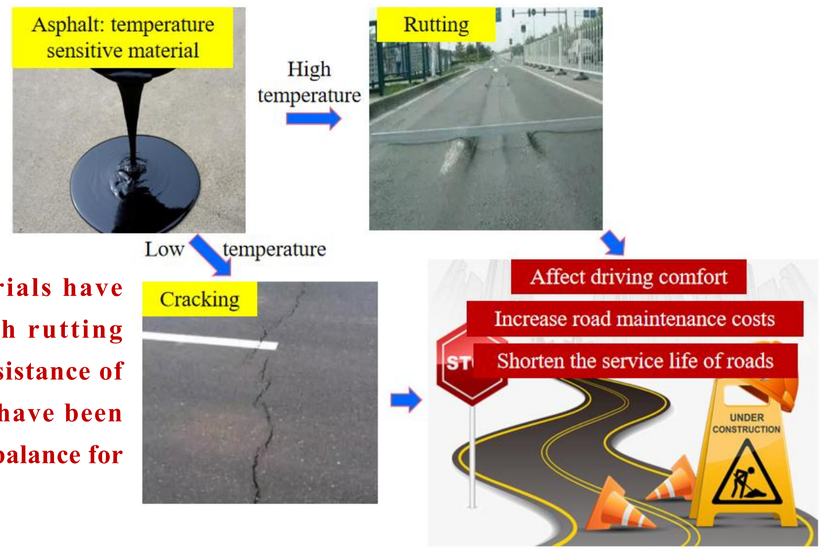
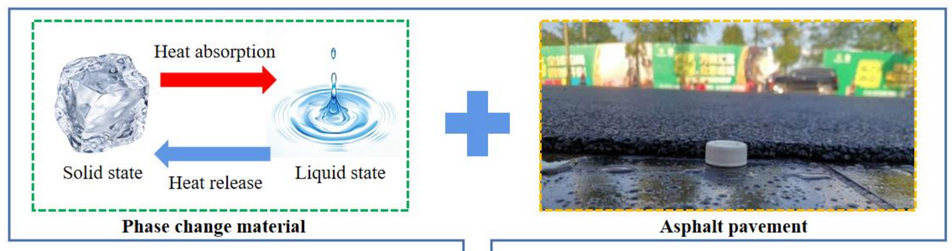
Introduction



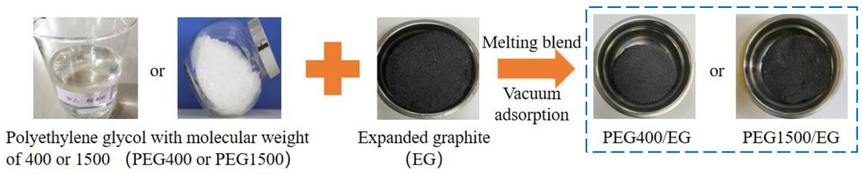
- **Dual phase change materials have potential to improve both rutting resistance and cracking resistance of asphalt pavement, which have been recognized very difficult to balance for a long time.**



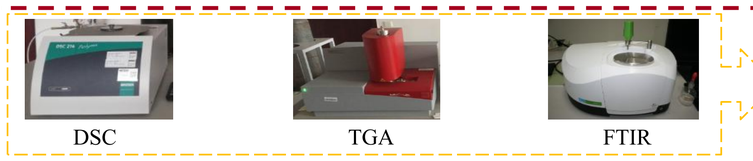
Objectives

- Study the phase change behavior, thermal stability and chemical stability of two composite phase change materials (CPCMs).
- Study the temperature adjusting performance of dual phase change material (DPCM) for asphalt mixtures.

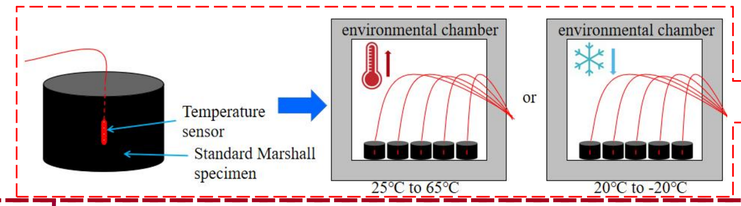
Materials & Methodologies



Preparation of composite phase change materials



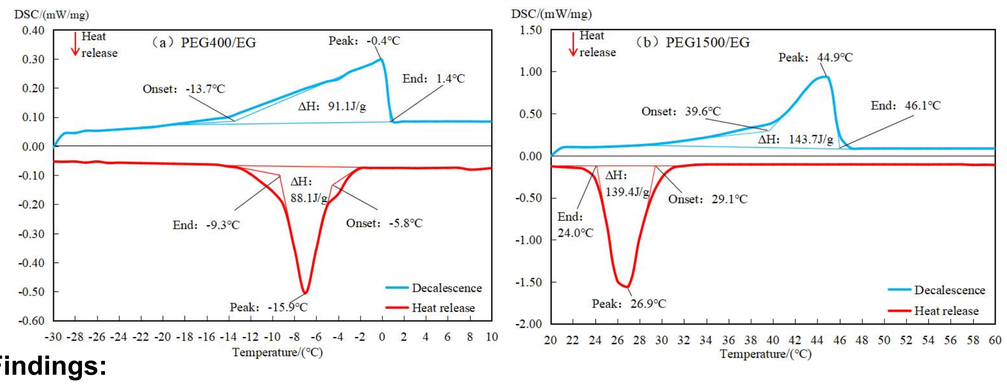
Properties of composite phase change materials



Temperature adjusting performance of asphalt mixture with dual phase change materials

Results and discussion

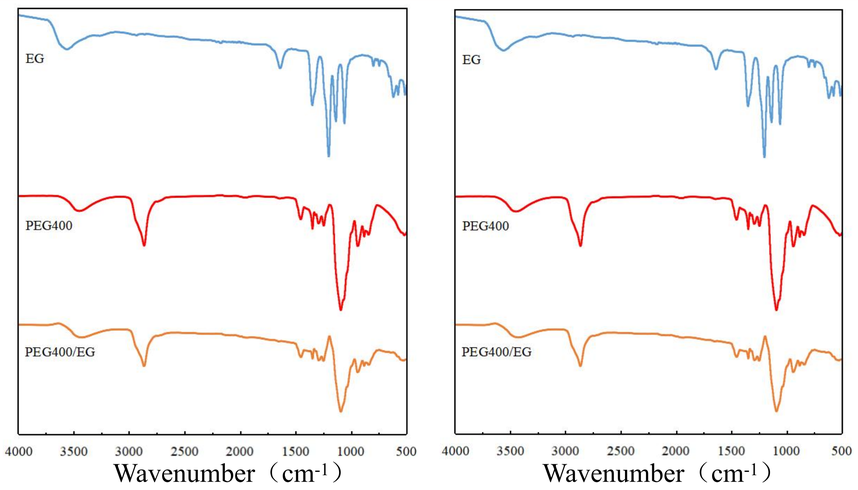
Phase change behavior of PEG/EG composite phase change materials



Findings:

- **Composite phase change materials had the characteristics of high enthalpy.**
- **Appropriate interval of phase change temperature of two composite phase change materials could meet the needs of asphalt pavements in summer and winter.**

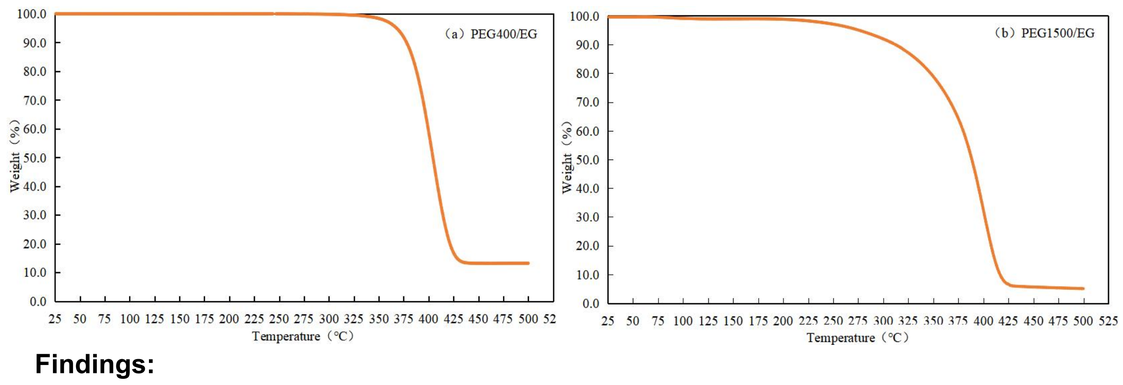
Chemical stability of PEG/EG composite phase change materials



Findings:

- **The reaction between PEG and EG was not chemical, so they would not affect their basic performance due to chemical reaction.**

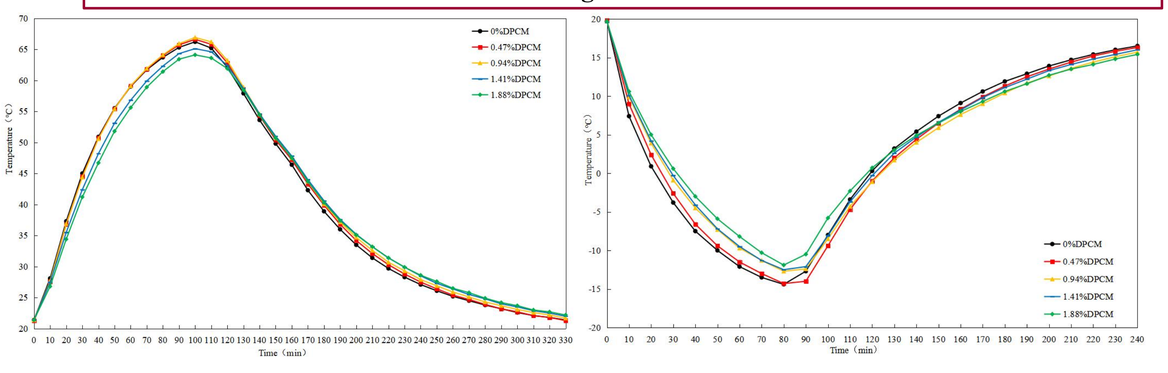
Thermal stability of PEG/EG composite phase change materials



Findings:

- **The decomposition temperatures of these two composite phase change materials were higher than 200 ℃.**
- **These composite phase change materials would not decompose during the preparation of modified asphalt mixture.**

Temperature adjusting performance of asphalt mixtures with different content of dual phase change materials



Findings:

- **Low content (0.47% and 0.94%) of DPCM increased the maximum temperature of asphalt mixtures.**
- **The maximum temperature of asphalt mixture with 1.88% of DPCM decreased by 2.1 ℃.**
- **The minimum temperature of asphalt mixture with 1.88% of DPCM increased by 2.5 ℃.**

Conclusions

1. **Two composite phase change materials had good thermal storage performance, thermal stability and chemical stability, so they can be used in asphalt pavement.**
2. **DPCM (composed by two composite phase change materials) reduced the maximum temperature of asphalt mixture by 2.1 ℃.**
3. **DPCM can increased the minimum temperature of asphalt mixture by 2.5 ℃.**

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