Expremental Evaluation of Asphalt Binders Properties Modified with Geopolymer and Acrylate Styrene Acrylonitrile

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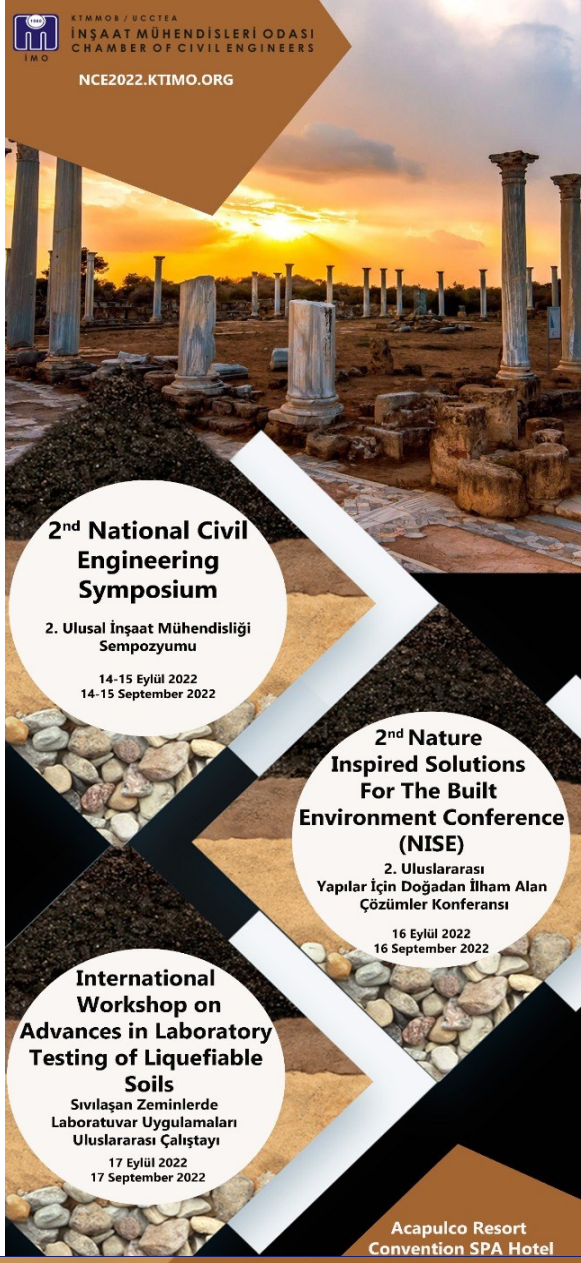


Guidelines

- ✓ Introduction.
- ✓ Materials.
- ✓ Samples preparation.
- ✓ Experımental Work.
- ✓ Results Discussion.
- ✓ Conclusion .

Introduction

- ✓ Asphalt pavement is employed in motorways and urban streets.
- ✓ Many roads around the world are influenced by challenging environmental conditions.
- ✓ Numerous studies have been conducted to introduce an appropriate additive materials.
- ✓ Asphalt Binders Properties Modified with Geopolymer and Acrylate Styrene Acrylonitrile.

Materials

The base asphlat binder used was 60/70 penetration grade.
The polymer was Acrylate Styrene Acrylonitrile (ASA) polymer supplied from a company in China in powder form, while geopolymer (GEO) was produced in the labrotory by mixing of sodium silicate solution and sodium hydroxide solution.

Table1. Physical propertes of the base asphlat binders

Material	Property	Standard	Value
Asphalt 60/70	Specific Gravity	ASTM D70	1.03
	Penetration @25° C	ASTM D5	70
	Softing Point(°C)	ASTM D36	46.0
	Viscosity@135°C (Pa.s)	ASTM D4402	0.24

Samples Preparation

The base binder was heated to be in liquid form followed by adding both modifires, the ASA and GEO, into the binder, blended with different percentages of 3, 5, and 7% by weight of the asphalt binder. The GEO blend was mixed for 90 minutes with a mechanical shear mixer at a speed of 1000 rpm and a temperature of 150 (±5 °C), while the ASA blend was mixed for 90 minutes at a temperature of 170 °C (±1 °C) and a speed of 5000 rpm to produce a homogenous blend.

Experimental Work

Softening Point Test

Viscosity Test

Rutting and Failure Temperatures Test.

Results Discussion

The impact of modifers on the Softening point

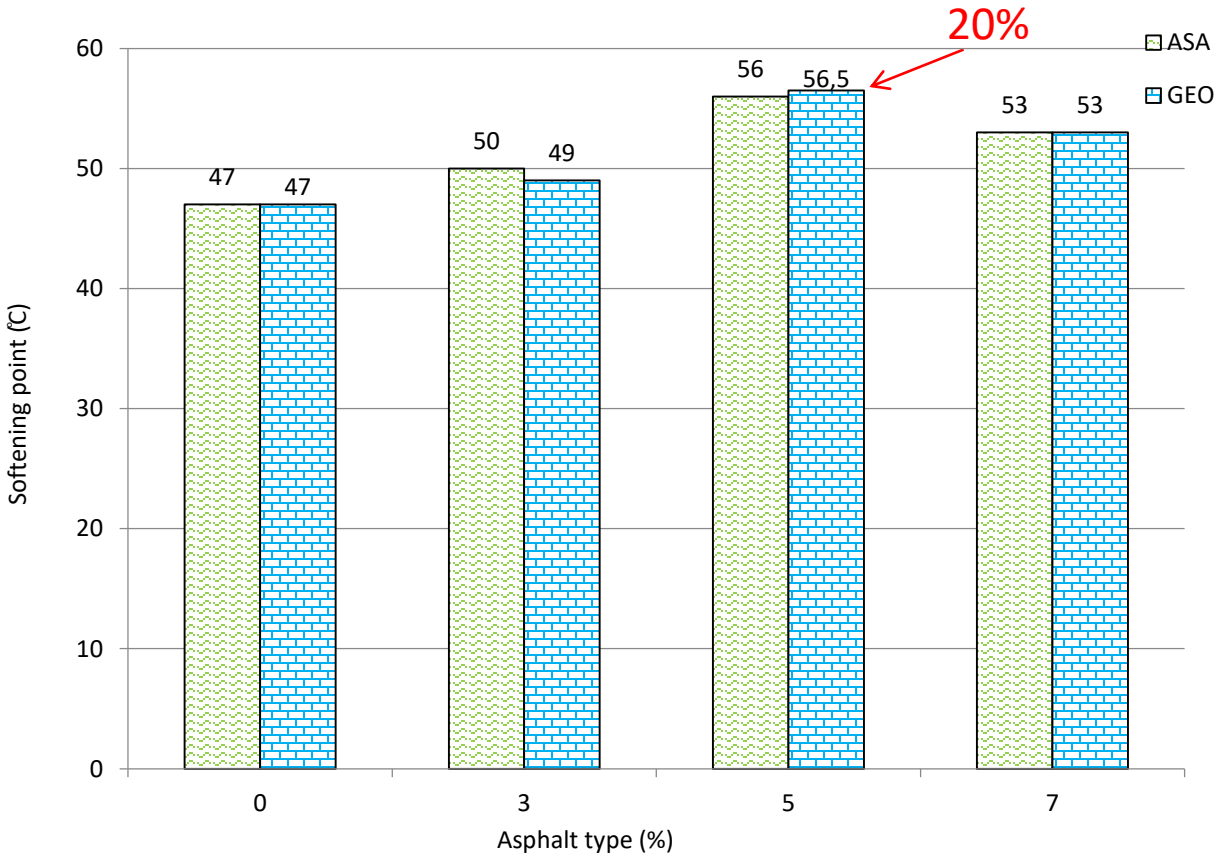
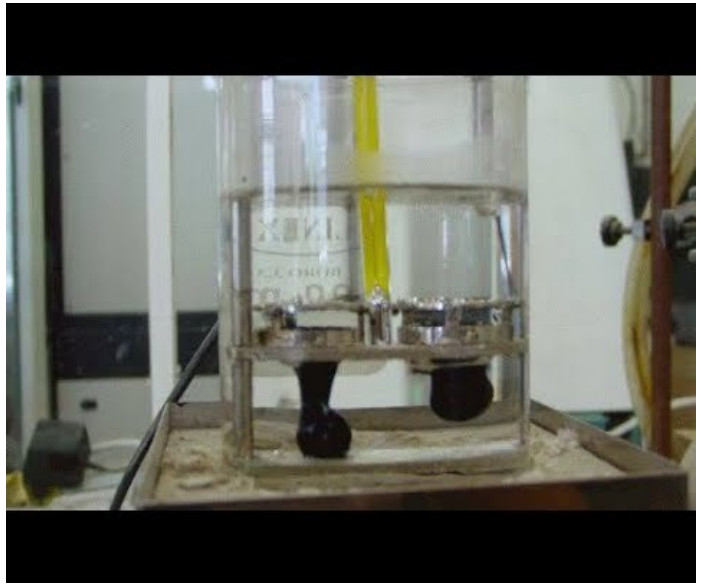
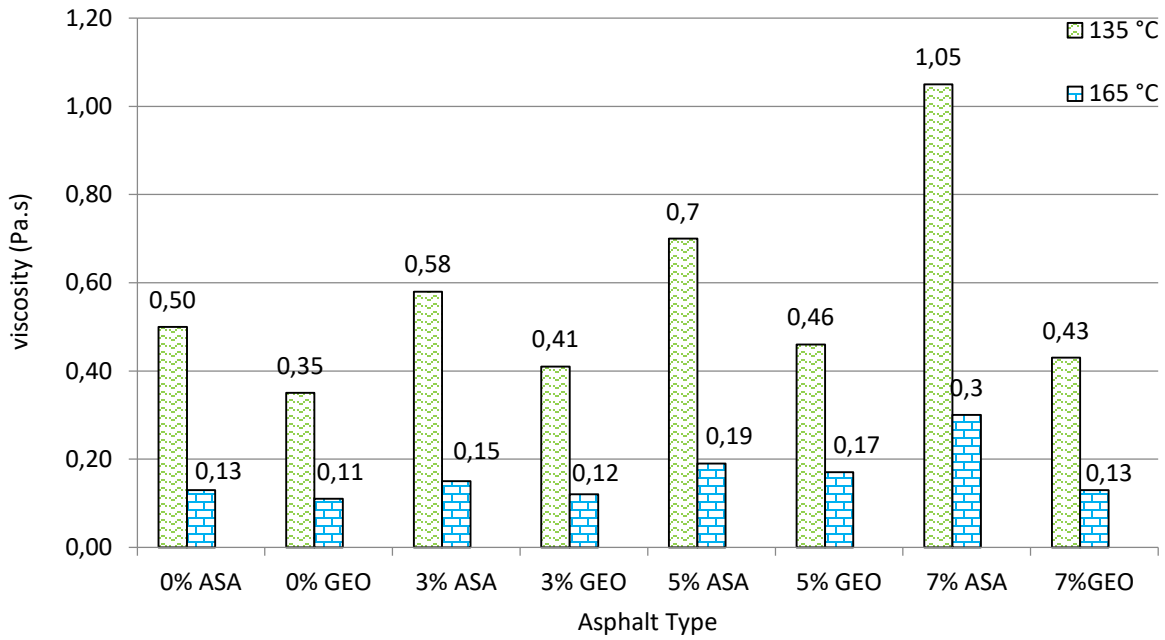


Figure 1. Softening point of base, ASA and GEO

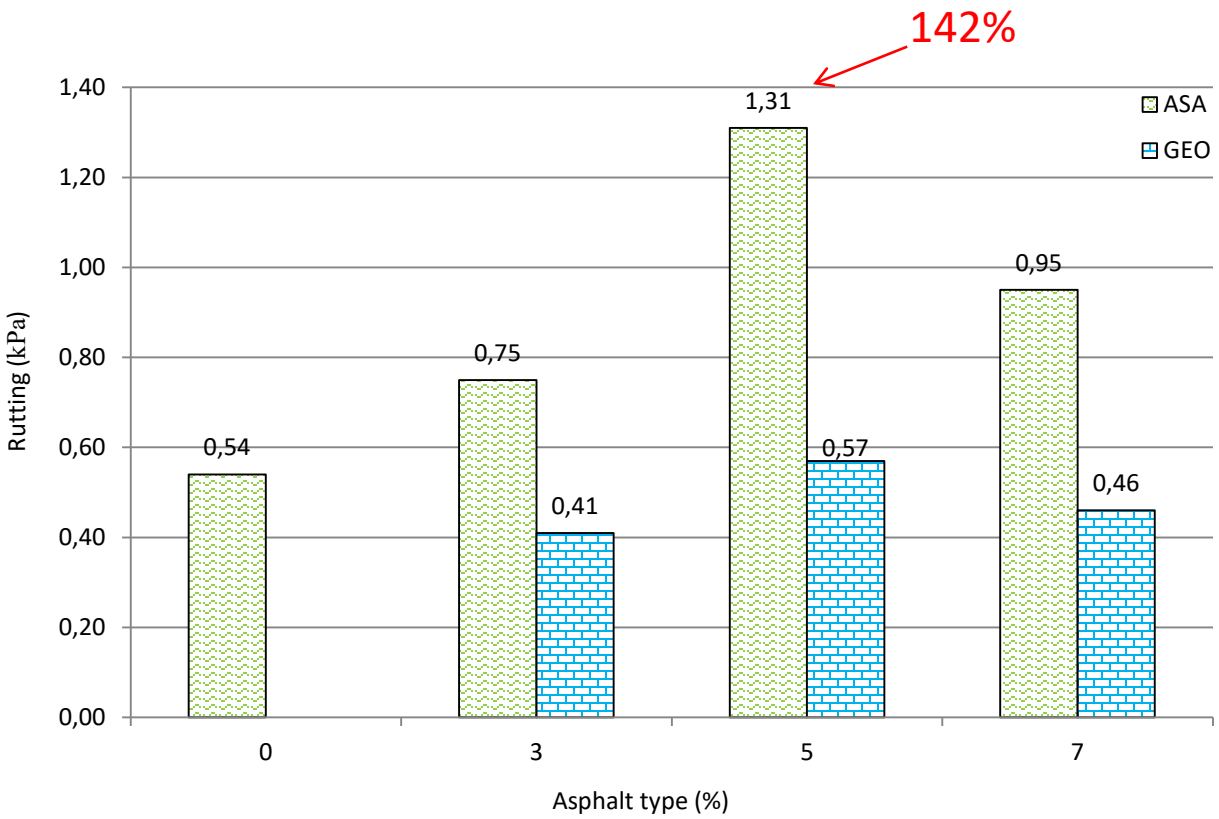


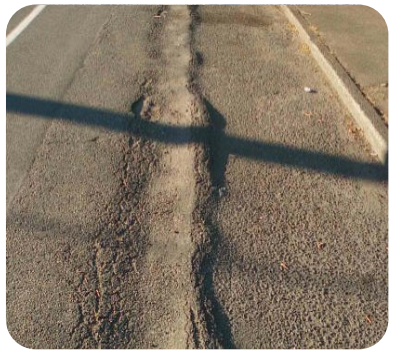
The impact of modifers on the Viscosity



Figures 2. Viscosity of base, ASA and GEO modifed asphalt binders

The impact of modifer on Rutting parameter





Rutting

Figure 3. Rutting parameter for base, ASA and GEO modified asphalt binders

The Effects of modifiers on failure temperature

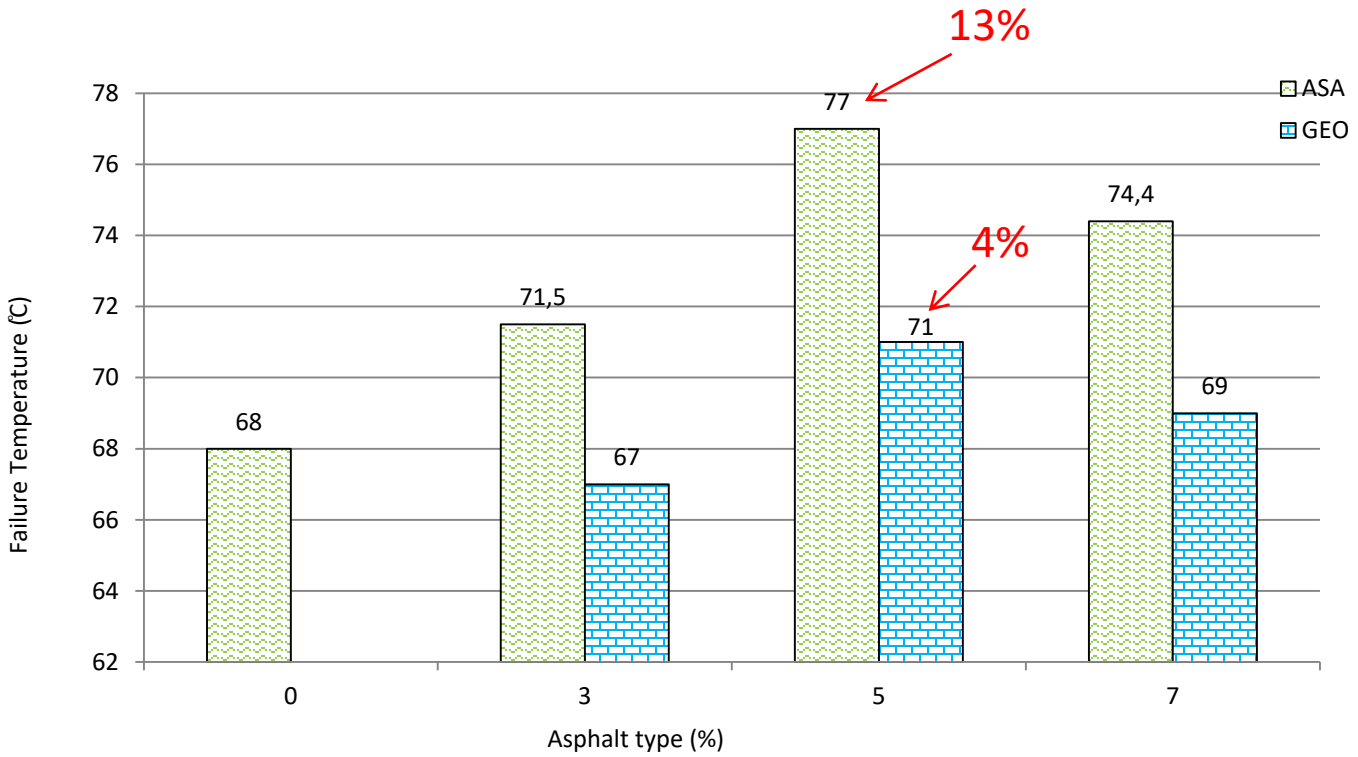


Figure 4. Failure temperatures of base, ASA and GEO modified asphalt binders

Conclusion

- ✓ This study was conducted to evaluate the effects of using ASA and GEO polymers on the physical and rheological properties of the asphalt binder.
- ✓ The results demonstrated that the addition of increament of ASA polymer has a noticeable impact on both physical and rheological characteristics, while the addition of GEO-polymer into the matrix of asphalt binder has a slight impact.
- ✓ The results showed that the ASA polymer has the ability to increase the rutting resistance as the failure temperature improved.
- ✓ 5% of both modifiers can be considered as the optimum modifier content of the asphalt binder.

References

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THANK YOU