



Liquid Rubber Modifier in Asphalt Binders

Approximately 246 million scrap tires (~4 million tons) are generated annually in the United States. The tire industry has dramatically increased the market for used tires since the 1990s (from 11% to 87.9%), with only 12.1 % of used tires going to landfills or storage facilities. Common markets for scrap tires include tire-derived fuels, ground rubber, and civil engineering applications. For example, crumb rubber has been added to asphalt to help increase the rheological (ability to move and flow unlike conventional liquids such as water) properties of asphalt. Good rheological properties in an asphalt give pavement the ability to deform under shear stress without cracking or breaking, making the road stronger and more resistant to forming cracks and potholes.

Adding crumb rubber to asphalt has its draw backs though. It is prone to separation due to density differences between the solid crumb rubber and the liquid asphalt binder. In addition, the solid nature of the crumb rubber makes the asphalt difficult to pump and therefore, may cause problems with the construction equipment. Some studies have looked at using finer crumb particles, chemical treatments, or the introduction of stabilizers in the asphalt mix but these showed only small improvements with a big cost increase.

ISTC researchers teamed up with researchers from the North Carolina A&T State University to look at how using liquid rubber, instead of crumb rubber, from scrap tires would impact the physio-chemical properties of asphalt. The process of pyrolysis (high heat and pressure without oxygen) was used to recover the tires' starting materials of oils, steel, fibers, and carbon black.

Liquid rubber from the scrap tires that have undergone pyrolysis was added to petroleum asphalt at three rates (5%, 10%, and 15%). The team found that rheological properties were improved and stress buildup due to shear strain was reduced with increasing amounts of liquid rubber. In addition, the impacts of aging (reduced rheological and viscoelastic properties) was decreased with increasing liquid rubber additions. The team suggested that even greater improvements in these properties could be made with the combination of liquid and crumb rubber additions, but more research is needed.

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Publications

- Investigating the effectiveness of liquid rubber as a modifier for asphalt binder



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