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## Using oil shale ash waste as a modifier for asphalt binders

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**Abstract:** Oil shale rocks represent one of the most available sources of energy. Jordan land contains about 50 billion tons of oil shale, which makes Jordan the third in the world of the reserve of this material. Oil shale ash is a byproduct of the oil shale manufacturing process and considered a waste material and may cause hazards for human health. In this study, the effect of oil shale ash on asphalt binder rheological properties at higher temperatures was investigated. Five oil shale ash to asphalt (OSA/A) percentages by volume (0, 5, 10, 15, and 20 %) were used. The complex shear modulus ( $G^*$ ) and phase angle ( $\delta$ ) of asphalt binders were investigated using the Superpave Dynamic Shear Rheometer and the rotational viscosity (RV). It was found that increasing the OSA/A percentage increased the  $G^*$  value and the RV of asphalt binders, and improved the Superpave rutting parameter, but did not affect significantly the phase angle. Thus, adding oil shale ash (the waste material) to asphalt binder enhanced its rheological properties and performance at high temperatures.