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The chemo-microstructure-mechanical relationships for bitumne XIAOKONG YU, NANCY BURNHAM, Worcester Polytechnic Institute, SERGIO GRANADOS-FOCIL, Clark University, MINGJIANG TAO, Worcester Polytechnic Institute — Previous studies suggest that bitumen's diverse microstructures are related to its physical and rheological properties; yet the chemical-mechanical relationships for bitumen have been very challenging to establish due to bitumen's complicated molecular interactions. This study aims to enable chemical optimization of bitumen that gives preferable mechanical properties. Two representative asphalt binders were chosen and derivative binders were prepared by remixing their asphaltene and maltene fractions at different ratios. For all binders, their microscopic morphology and mechanical contrast were evaluated using atomic force microscopy (AFM), and their bulk thermal and rheological properties were studied with differential scanning calorimetry and a dynamic shear rheometer, respectively. Bitumen's chemical composition affects its thermal and rheological properties through its characteristic microstructures. Phase segregation observed in AFM agrees with larges gaps among the multiple T_gs, both of which are relevant to the aggregation behavior of the asphaltene fraction.

Xiaokong Yu
Worcester Polytechnic Institute

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