Nanoscale and Macroscale Characterization of the Influence of RAP and RAS on Cracking Resistance of Asphalt Mixes

Sample Preparation

Binder was placed on a glass microscope slide that was broken in half and attached together at the opposite ends. Then the the samples were heated. The RAP and virgin binders were soft enough after heating at 153°C for 5 min. However, the tear-off RAS binders took 2 h at 210°C, along with added weight on top of the samples.

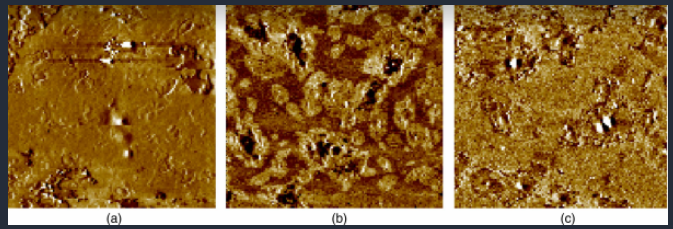
Teflon paper was placed between the weight and the RAS binder. After that, they were allowed to cool down to RT. The tape longitudinal to the slide was removed and the two halves of the slide were separated. The slides with recycled materials were then heated for 30 s at 153°C. Next, the slide with the virgin asphalt binder was quickly pressed against the edge of the recycled binder slide. The assembly of two slides was heated for 3 min at 153°C immediately after they were combined together to finally create a film with an interfacial zone at the middle.

Analytical Results

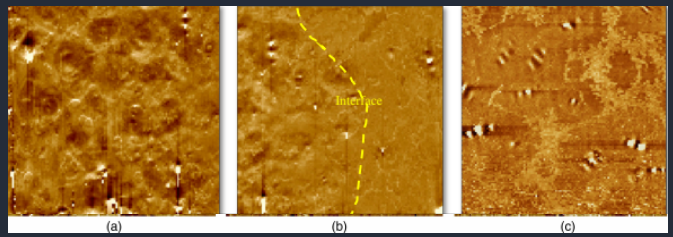
As the objective of the paper is to compare the blending thatc occurs between RAP binder and a virgin asphalt binder to the blending that occurs between RAS and the same virgin asphalt binder and to explain the effect of RAP, RAS, and their combination on the macroscale cracking properties of asphalt mixtures.

For the RAP samples, there was some blending at the interface between the RAP and virgin binders, which occurred on the microscale level ina fairly uniform manner.

As for the RAS, no blending occurred between the tear-off RAS and the virgin asphalt binders considered in this study.



AFM phase imaging of (a) RAP binder zone; (b) blending zone; and (c) virgin binder.



AFM phase imaging of (a) tear-off RAS zone; (b) blending zone; and (c) PG 64-28 virgin asphalt binder. The main distinction between the RAS and the virgin asphalt binder can be seen within the interfacial zone.

Reference: Nazzal, Munir D, Holcombe, Evan Kim, Sang Soo Abbas, Ala Kaya, Savas, (2018), Nanoscale and Macroscale Characterization of the Influence of RAP and RAS on Cracking Resistance of Asphalt Mixes, J. Mater. Civ. Eng., 2018, 30(12):