Rheological performance and high stability of bitumen modified with surfactant, rubber (SBR/BR) and crumb rubber (CR) additives.

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ABSTRACT: In this contribution, the mechanical and physico-chemical properties of a new kind of modified bitumen are presented. The bituminous binder was modified in order to understand the effect on the structural properties of several compounds such as a stabilizing surfactant (S), a Polymer Blend (SBR/BR) and a crumb rubber (CR). Laboratory tests were focused on the characterization of bitumen modified with binary combinations of S-SBR/BR and S-CR additives and compared with binder as a reference. This work deals with the characterization conducted by using conventional as well as advanced methods on bitumens. Fundamental rheological tests, based on dynamic shear rheometer in the temperature range from -30 °C to +160 °C and advanced ¹H Magnetic Resonance Relaxometry analysis were used to evaluate the effect of modifiers on the bitumen structure. Rationalization of all the data was achieved with the aid of X-Ray Photoelectron experiments.

For determination of stability of the surfactant and Rubber, modified bitumen tube testing method was performed. Based on the result analysis, an improvement of the viscoelastic properties of surfactant-modified bitumen was ascertained. The addition of surfactant was crucial and it allowed using both SBR/BR and CR as modifiers to overcome physico-chemical drawbacks such as, e.g., sedimentation phenomena.