



## KEYNOTE LECTURE:

# Understanding the resilience of asphalt through its internal structure

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**Dr.-Ing. Miomir Miljković** is a senior scientific associate at ZAG (Slovenian National Building and Civil Engineering Institute) and an assistant professor at the University of Niš, Faculty of Civil Engineering and Architecture, specialising in asphalt pavement engineering. He obtained his Doctor of Engineering degree in 2014 at Ruhr-Universität Bochum (Germany) and conducted postdoctoral research from 2017 to 2018 at Empa, Swiss Federal Laboratories for Materials Science and Technology (Switzerland). His main research area is the materials science of asphalt pavement engineering and road infrastructure, comprising the following topics: (1) advanced rheo-mechanical characterisation of bitumen-based materials (especially sub-mortar phases) in both linear and non-linear domains, including damage and fracture analysis; (2) micro- and mesostructural analysis of the temporal evolution in bitumen-based materials and composites using various microscopic techniques, as well as X-ray and neutron tomography, with quantitative morphological analysis; (3) polymer-modified bitumen and its spatiotemporal phase and interphase chemo-mechanical interactions; (4) multiphase model systems of alternative bituminous binders; (5) recycling of asphalt (including hot and cold recycling, as well as physicochemical aspects of ageing, rejuvenation, and healing); (6) use of alternative or complementary binders and aggregate in asphalt.

Miomir Miljković is an associate editor, editorial board member, and reviewer for numerous leading international scientific journals. He has received several honours and awards, including recognition as an Outstanding Academic Member of the Academy of Pavement Science and Engineering. He is also an active member of many international scientific and professional organisations, with senior membership of RILEM (including co-establishing and leading several of its technical committees) representing his most prominent commitment.

**Abstract:** Asphalt is a key structural and functional component of road infrastructure, and also its most financially valuable part. Therefore, its resilience and sustainability must be considered strategic elements of economic growth and overall environmental impact, given their central role in the performance of the global road network. The mechanical behaviour of asphalt depends strongly on the properties of its critical material phases (bitumen, mortar, and mastic), as well as their relative proportions, spatial arrangement, and physicochemical interactions.



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Nevertheless, for the reliable introduction of novel asphalt material concepts, understanding the state and kinetics of evolution of their internal structure is essential for a thorough interpretation of complex physicochemical behaviour. This lecture will therefore present how advanced microscopic and tomographic techniques can compensate for the lack of common experimental evidence regarding physicochemical evolution and mechanical damage. These techniques can also help identify key arguments to revise customary empirical hypotheses on the distribution of damage, saturation, and other effects.