

Editorial

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This special thematic issue is devoted to bituminous pavement materials and structures which are key elements of modern asphalt road infrastructure. It covers a wide range of topics which are currently under the focus of intensive research and development worldwide. These activities are driven by the need of sustainable development from both the environmental and the economic point of view. They are challenged by the increasing need of more durable, stronger and safer roads for global transport of heavier loads and larger quantities of goods as well as the growing demand for personal mobility. This is not only true for highly industrialized regions but also for economically evolving countries and those that appear just on the beginning of these developments.

Given this situation, it is obvious, that needs and requirements in different parts of the world vary considerably. Differences also exist for long distance roads in open ranges under various climatic and geographic conditions and for roads in densely populated urban areas with complex transport infrastructures and traffic regimes, requiring fast

construction and repair for avoiding congestions and accidents. In case of long distance roads for high speed traffic, the use of local and sometimes marginal materials is of major importance in order to keep construction costs at minimum whereas in the urban areas, elaborate and sometimes highly specialized materials for fast construction and low speed traffic is required. However, in all cases, the vision is zero maintenance and perpetual service life.

In order to meet these challenges, a great variety of road structures, materials and construction techniques has been developed and is still under development, requiring in depth scientific and technical understanding on how the different components of the materials and structures behave and interact on a micro- and macroscopic scale. This includes not only issues such as creep, fatigue cracking, aging, moisture susceptibility and driving safety, but also consumption of energy and natural resources, re-use and recycling as well as multifunctional use of roads not only for traffic but also for other purposes such as noise reduction, water retention, self-deicing, heat island reduction, data acquisition/transport (smart roads) and energy harvesting. Hence, it is exciting to see how road pavements are about to change from a mere driving platform for a safe, smooth dust and mud free ride to a heavily engineered infrastructure element with challenging multifunctional properties.

Not all of these subjects can be covered in one special thematic issue on asphalt pavements, of course, and some of them will be repeatedly part of

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regular issues of this journal. However, the papers in this issue, prepared by selected experts, provide a cross-section through specific focus topics regarding modern testing and measurement techniques for bituminous pavement materials in the micro and macro range, e.g. FTIR, computed X-ray tomography (CT), image correlation and analysis, accelerated pavement testing with traffic simulators (APT). This includes special experimental and modelling aspects of bituminous pavement materials and their behavior, such as the use of reclaimed asphalt, warm mix technology, aggregate packing and reinforcement with grids as well as the effect of cracking, bitumen-aggregate adhesion, filler-bitumen interaction and

interlayer bond. Some of these topics are also subject of the three actual Rilem technical committees on *Testing and Characterization of Sustainable Innovative Bituminous Materials and Systems (SIB)*, *Mechanisms of Cracking and Debonding in Asphalt and Composite Pavements (MCD)*, *Chemo-Mechanical Characterization of Bituminous Materials (CBM)*.

In this sense, I hope that this first thematic issue on bituminous asphalt pavement materials will provide inspiring and helpful insight in the field of bituminous materials and reveal the considerable scientific and technological potential of this type of materials for further sustainable road infrastructure development.