Editor's Corner

ISSN 1997-1400 Int. J. Pavement Res. Technol. 2(6)

High-Performance Infrastructure Systems and Materials

Björn Birgisson, Ph.D., P.E.
Vice President for Research
KTH Royal Institute of Technology
Stockholm, Sweden (bjornbir@kth.se)

An aging constructed highway infrastructure, escalating energy and construction costs, and increasing demand due to population growth present a formidable challenge in terms of renewing, enhancing, and sustaining this essential element of our economy and quality of life. Accurate assessment of existing highway infrastructure conditions and deterioration mechanisms are needed to optimize use of public funds and minimize disruptions. The development of high performance materials and advanced sensing systems is required to generate economically viable solutions.

A major enabler for future improvements in the monitoring of highway infrastructure conditions is the emergence of new vehicle-to-vehicle (V2V) communications networks that enable cars to communicate with each other, and with the highway infrastructure such as embedded sensors in the road, traffic lights, etc. via vehicle-to-infrastructure (V2I) links. A new wireless standard has recently been developed and will be launched by all major car manufacturers by 2012. This new standard is called Dedicated Short Range Communication (DSRC). It provides high-speed data connections over distances of up to 200*m*, and safety and emergency communications at lower speeds over distances of up to a kilometer from one vehicle to another, and between vehicles and roadside transmitters. Some potential applications of DSRC are, for example, to warm of congestion, to signal icy road conditions between cars, to warn of bridge failures, or simply to allow real time monitoring of road structural conditions. V2V technology is now being considered for roadside inspections, freight tracking, road-condition notifications, parking management, and enforcing rules on drivers' working hours.

Another exciting development is the emergency of nanotechnology in concrete and bitumen-based materials research. The introduction of nanotechnology into pavement construction materials promises to deliver high-performance, longer lasting, economical "designer" materials for specific applications and needs. For example, during a National Science Foundation (NSF) workshop on nanotechnology in construction materials held in Gainesville, Florida in 2006, recent reported developments included a new nano-engineering-based process to make concrete that does not shrink during hydration, or concrete that has significantly improved interfacial transition zone structure between aggregates and the paste. Other reported developments included the introduction of microfibers into nanomodified concrete to greatly enhance the ductility and strength of the concrete.

The possibility of being able to economically make pavements that are constructed with high strength, non-shrinking ductile concrete that does not crack or rut may lead to a doubling or more in the life of the pavement.

The Transportation Research Board (TRB) is hosting the First International Conference on Nanotechnology-Based Concrete in Irvine, California from May 5-7, 2010. Many of the promising new developments and innovations will be highlighted at this conference.

What exciting times we live in today!