Objectives of research on road materials

> To deliver **environmental and sustainability benefits** through the advances in road materials engineering (problems of resources availability)

> To **develop new binders**, additives and mixtures to improve performance at low costs

> To improve the methods to **measure and model the performance** of road materials

> To solve public **expectations of quality, safety and noise** on roads

> To develop **innovative high-technology** materials
Current/future research on road materials

> **Performance evaluation of road materials** (binders, aggregates, additives, mixtures) using new scientific and multidisciplinary advances

> **New/enhanced tests or devices** to simulate *in situ* conditions and obtain more accurate results

> **Use of new models** (viscoelasticity, plasticity) to simulate and predict road materials behaviour

> **Implementation of new technologies** to produce good performance mixtures with low energy consumption (WMA, half-WMA)
Current/future research on road materials

> New products/approaches to **reduce wastes** from road pavements and better use of materials

> Use of **high RAP content** in recycled mixtures (cold or hot recycling in place or in the plant)

> New methods and tests to **characterize RAP material and design recycled mixtures** (recycling of AR or polymer modified mixtures)

> Use of alternative or currently **marginal materials**, or wastes from other industries
Current/future research on road materials

> Assessment of risks linked to the use of less conventional materials in road pavements (leaching, emissions, health problems, recycling)

> Use of new materials adjusted to the desired properties in the pavement (rutting or fatigue resistance, low noise, low roughness)

> Development of new binders (bio-binders)

> Development of new additives and treatments for flexible road pavements
Current/future research on road materials

- Micro/nano evaluation of the interactions (physical and chemical analysis) between the constituents of road materials
- Soil stabilization with non-traditional stabilizers (Bio-stabilization of soils)
- Use of thermally optimized mixtures (open graded surfacings, cool pavements)
- Research of innovative high-risk, high-reward materials development (photoelectric roads)
Contents of session 1 – Materials

Advances in performance evaluation of asphalt binders
(10:30-10:50) > Hussein Bahia

Cyclic behaviour of bituminous materials: new results and modelling
(10:50-11:10) > Hervé di Benedetto

Use of binder additives in different Warm Mix Asphalts
(11:10-11:30) > Joel Oliveira and Hugo Silva

Asphalt mixtures with high RAP content: design and performance
(11:30-11:50) > Maria de Lurdes Antunes, Fátima Batista, Luís Picado Santos, Paulo Pereira and Jorge Pais

Long term flexible pavement performance modelling
(11:50-12:10) > Andrew Collop

(12:10-12:30) > Discussion
Advances in performance evaluation of asphalt binders

Hussein Bahia

Int. Journal RMPD speaker: Editor-in-Chief
University of Wisconsin, UW Madison, USA
Professor, PhD
Research on pavement materials and design, modified asphalt, emulsions and mixtures

Summary of the presentation
Performing grading (PG) background
New concepts: damage resistance characterization
New tests: creep and recovery
Cyclic behaviour of bituminous materials: new results and modelling

Hervé di Benedetto
Int. Journal RMPD speaker: Editor-in-Chief
Ecole National des Travaux Publics de l’Etat, France
Professor, PhD

Study of mechanical, thermo-mechanical and structural behaviour of geomaterial; experimental and modelling research

Summary of the presentation
> Challenge of bituminous materials; complex modulus tests (quasi static): mixes, mastics & bitumen); linear viscoleastic domain
Use of binder additives in different Warm Mix Asphalts

Joel Oliveira et al.
Portuguese invited speaker
University of Minho, Dep. Civil Engineering, Portugal
Assistant Professor, PhD
Interests: Sustainable pavements, Recycling, Energy efficiency

Summary of the presentation
- Comparison (lab and trial) between HMA and WMA mixes produced with (1) Synthetic waxes or (2) Surfactants
- Further use of waxes in less usual binders (hard and soft)
- Further use of surfactants in AR and recycled mixtures
- WMA additives usually maintained/improved the performance
Asphalt mixtures with high RAP content: design and performance

Maria de Lurdes Antunes et al.
Portuguese invited speaker
LNEC, Portugal
Principal Researcher, PhD
Interests: Pavement materials; Pavement design; Pavement monitoring, evaluation and modelling; Pavement performance evaluation

Summary of the presentation
> Mixes design and performance evaluation
Long term flexible performance modelling

Andrew Collop
Int. Journal RMPD speaker: Editor-in-Chief
University of Nottingham, Director NTEC
Professor, PhD

Summary of the presentation
> Investigate the effects of dynamic loading on long term pavement performance (move away from the 4th power law)
> Aggregate damage approach; damage prediction; spatial repeatability; full-scale experiment