

SUMMARY

ERR 9
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EDITORIAL

4th World Congress on Emulsions

Alain Le Coroller, Publication Manager

1

Breaking Behaviour

Phosphoric acid in microsurfacing emulsions

4

Phosphoric acid can be used instead of hydrochloric acid to prepare microsurfacing emulsions. The resulting slurries cure by a different mechanism than the conventional ones, which allows the emulsions to be prepared with a wider range of asphalt sources. The pH changes in the phosphoric acid slurry system are much less pronounced than that of the conventional hydrochloric acid system. The article describes how the phosphoric acid activates the cement mineral filler used in the slurry recipe, and this activated cement adsorbs emulsifier leading to setting of the slurry surfacing.

Alan James, Antonio Ng

Formulation of emulsion based products



10

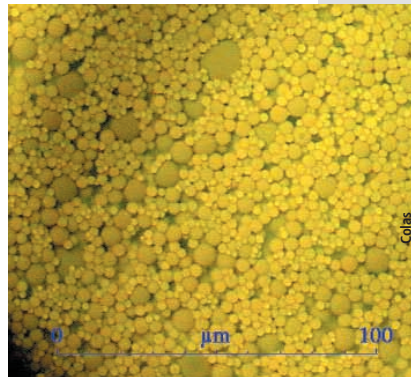
Aggregate particulates unfit for surface dressing use due to high dust content

Bitumen emulsion for binding dust on stone aggregate surface

10

Aggregates for use in road surface dressing operations are produced in quarries by screening crushed aggregates into defined particle sizes within predetermined ranges. However, dust particles (< 0.63µm) tend to adhere to the larger aggregate particles. At a level above 0.7% this may lead to problems on road application as the dust creates a physical barrier between the large aggregate and the bitumen, preventing adequate adhesion and increasing the risk of premature failure of the surface dressing. Dust reduction is normally achieved by a washing process at the quarry using water.

This washing can use large volumes of water having environmental implications. Jeff Barnes



14

Characterization of the different phases in the life cycle of the binder in a bitumen emulsion: recovery methods

14

Several techniques are available, in order to recover a binder from a bitumen emulsion for further characterisation. Some of them consist in allowing a thin film of emulsion to stand in an oven at a given temperature; other methods consist in heating the emulsion, and then the residual binder, in various conditions.

Processes which enable the recovery of the binder without changing its characteristics are especially useful when performing an assessment study, during which it is often necessary to revert to the characteristics of the binder before emulsification.

Carole Gueit, Michel Robert, Graziella Durand

Nanoemulsions

Study of droplet break-up and recoalescence phenomena during mechanical emulsification

23

Emulsion properties are most often determined by the size distribution of the dispersed droplets. During emulsification, the droplet size distribution is influenced not only by droplet break-up but also by the kinetic stability of the newly created droplets. These in turn have to be stabilised by adsorbing emulsifier molecules. Thus the type of emulsifier selected is of critical importance to the properties of the final product. For emulsions in the submicron range – as are important for pharmaceutical, cosmetic as well as food applications – a high pressure homogeniser is the machine of choice. During high-pressure homogenisation with a simple orifice valve droplets are deformed in laminar flow before and within the orifice valve and disrupted after the valve outlet by forces in turbulent flow. In this study the role of the emulsifier in droplet deformation and break-up as well as short-term stabilisation in high pressure homogenisation is presented.

Lidia Kempa, Helmar Schubert, Heike P. Schuchmann

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Emulsions and sustainable development



27

Finished warm mix Sections, E9, N1, and N2

Emulsion-based warm mix asphalt: materials and field performance

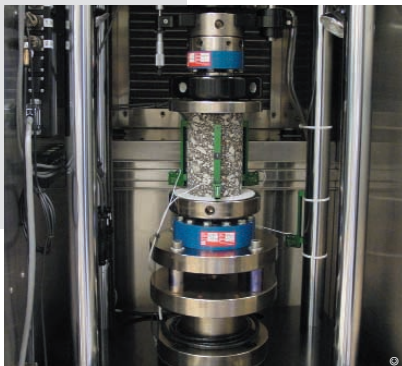
27

In North America, average mixing temperatures during production of hot mix asphalts range from roughly 140°C to 160°C. In recent years, a number of warm mix asphalt technologies have been developed that allow contractors to work below this temperature range without either lowering mix quality or causing pavement performance deficiencies. Hot mix contractors and road authorities alike may realize numerous benefits by reducing mix and compaction temperatures. Among these are reduced plant wear, increased manufacturing throughput, decreased binder aging, wider winter paving window, extended haul distances, and easier permitting.

Everett Crews

Reclaiming and recycling with emulsion

32



Testing asphalt emulsion

Full Depth Reclamation (FDR) mixes for pavement design

32

Full Depth Reclamation (FDR) with asphalt emulsion is an effective method for rehabilitating distressed roads. A reclaimer mills through the asphalt layer, incorporates underlying aggregate base, adds asphalt emulsion, mixes the material, and lays it back down. Compactors and motor graders complete the process, and the new layer is ready for traffic that same day. The process adds strength and flexibility to the pavement, as well as removes distresses to improve future performance.

Pavement design methods used in the U.S. do not account for the unique properties of FDR. These mixes behave somewhat similar to granular bases in nature in their early life. After curing, this material exhibits the same visco-elastic stiffness and performance-related properties of asphalt concrete. This change in behavior depends on the materials that were stabilized and the properties of the asphalt emulsion with which they were stabilized.

Todd W. Thomas, Richard W. May

End Use Properties

Assessment of chemical reactivity and short term cohesion of cold reclaimed asphalt mixes

37

One of the tasks of the research program SCORE (Superior Cold Recycling), aimed to optimise the design of cold reclaimed asphalt mixes. For this purpose the LRPC Saint-Brieuc developed two test methods, which give a better understanding of chemical reactivity between Reclaimed Asphalt Pavement materials (RAP) and cationic emulsions. The first method consists in an acidified water extraction of the RAP materials. The pH of the solution is measured throughout the extraction procedure. The water is then analysed with atomic absorption spectroscopy in order to quantify the release of basic ions (Ca⁺⁺, Mg⁺⁺, Na⁺, K⁺). This method appeared to be sensitive enough to identify the main parameters, which can interfere in the breaking process of the emulsion (i.e. mineralogy of aggregates, grading, surface covered by bitumen). The second method consists in a quantification of the short-term cohesion build up of the cold mixes, using torque measurements. The torque measurements are performed on cold mix samples maintained in a climatic chamber for different curing times. The sensitivity of the test method allows to identify the influence of the several parameters (mineralogy, emulsion formulation, addition of cement) on the short-term cohesion of the cold mixes.

Lionel Odie, Christelle Naudat, Yves Brosseau, Alain Beghin, Frédéric Placin, Bernard Eckmann, Frédéric Delfosse

Microsurfacing

Fibrous microsurfacing « Gripfibre »: Panorama of applications

42

Since 1986, Eurovia Company has developed and has been using the first, micro-surfacing, which involves gap graded crushed aggregates mixed with polymer modified emulsion in conjunction with synthetic fibers fulfilling the needs to improve the skid resistance of slurries products and make it more durable over time. Introducing fibers in the mix was a real innovation. The advantages which it provides, in both the short and the long term have made it possible to open a wide range of different microsurfacing application such as: high performance thin surfacing systems for motorways; surface treatment for "black spot area"; surface course with high amount of Recycling Asphalt Pavement (RAP); crack inhibitor layer; bond coat; colored surfacing.

The subject of this article is to present an overview of more than 15-20 years of experience and assessment with the different application mentioned above of fibrous microsurfacing products.

Samir Soliman

Climate change

GERICI project: Risk Management related to Climate Change for infrastructures

49

Climate change considerably modifies the vulnerability of infrastructures, and such concepts as the "hundred-year flood" can even become dangerous in this new context. Interesting conclusions were reached for infrastructure owners and a specific tool developed for infrastructure operators resulting from three years of research carried out after labelling by the RGCU (civil engineering and urban network) and with co-financing by the public works ministry. This project, managed by Egis (Scetauroute and Bceom) groups Sanef, ASF, Météo-France, LCPC and Esri France. The article describes the stages in the procedure and the geographical information system (SIG), a user-friendly and transposable support tool for technical and strategic investigations.

Hervé Guérard, Michel Ray