

## BITUMEN MICROSTRUCTURE AND BITUMEN AGEING

Florian Handle<sup>a</sup>, Bernhard Hofko<sup>b</sup>, Josef Füssl<sup>c</sup>, Lukas Eberhardsteiner<sup>b</sup>,  
Susanna Neudl<sup>a</sup>, Markus Hospodka<sup>b</sup>, Daniel Grossegger<sup>a</sup>, Ronald Blab<sup>b</sup>,  
Hinrich Grothe<sup>a</sup>

<sup>a</sup>Institute of Materials Chemistry, <sup>b</sup>Institute of Transportation,  
<sup>c</sup>Institute for Mechanics of Materials and Structures  
Vienna University of Technology, 1060 Vienna, Austria

Bitumen is an important industrial product of mineral oil refining and is used mostly for the production of asphalt concrete, i.e. a mixture of bitumen and mineral aggregates. The total market volume of bitumen for the EU is around €2-3 billion per year. High crude oil prizes, growing customer expectations, and regulations have uncovered the necessity to understand the microstructure and the ageing mechanisms in bitumen.

The CLSM (confocal laser scanning microscopy) allows the detailed observation of the fluorescent centers in bitumen. The origin of the fluorescence in bitumen is subject of ongoing debate in the scientific community. This visualization provides important clues on the microstructure and on asphaltene micelles. For polymer modified bitumina CLSM can provide information about polymeric network formation and quality of dispersion. The interpretation of these microstructures is possible by additional fluorescent spectroscopy of different bitumen phases obtained by chromatographic separation.

This investigation has led to an improved understanding of the micelle structure and a new model of bitumen ageing mechanisms. In particular new evidence was found to support the model of a micelle mantle consisting of aromatics and heteroaromatics surrounding and stabilizing the agglomerated asphaltenes.