



POSTDOC POSITION

Understanding interactions in bitumen-SBS copolymer blends

Ingénierie des Matériaux Polymères IMP - INSA de Lyon, Villeurbanne, France

A 12-month postdoctoral position funded by INSAVALOR will be available starting from October 2021 at INSA-Lyon, IMP laboratory (www.imp-umr5223.fr), in the frame of a close collaboration with Soprema and Colas Companies. This common project deals with the modification of bitumen with polymers [especially Styrene-Butadiene(-Styrene) block copolymers, SB(S)] in order to improve its thermomechanical behavior and fracture toughness.

Such blends are commonly used in road and pavement or roofing applications, to prepare materials with a better plasticity at low temperatures, together with a better creep resistance at high temperatures. However, the result strongly depends on the nature of the bitumen, a colloidal dispersion that, depending on its geographical origin, can show highly varying chemical composition (SARA fractions) and rheological behavior.

The main goal of this project is to acquire a better and more systematic understanding of the bitumen/polymer physico-chemical interactions that govern this behavior, using emerging approaches such as Hansen Solubility Parameters, HSP, turbidimetry, interfacial tension measurements, or confocal laser scanning microscopy, together with more conventional techniques like optical microscopy, viscosimetry, and rheology. Since bitumen is a dark medium, innovative experiments should also be proposed and implemented for a more thorough investigation of its properties.

This methodology will first be applied to a series of bitumens with different compositions or specific features. The aim is to precisely determine their HSP parameters and, if possible, relate them to the values of the SARA or SAR-AD fractions.

In a second step, similar studies will be carried out on SBS copolymers differing by their molecular architecture (linear, di/triblock, branched or star-shaped), styrene proportion, presence and amount of 1,2-units in the polybutadiene block, etc.

The objective is to manage to precisely assess the compatibility between any SB(S)-bitumen pair, and finally to be able to determine the optimal SB or SBS modifier for any given bitumen, in relation with the target application of the resulting binder.

Duration: 12 months

Net monthly salary : about 2 200 € (employer : Insavalor SA)

Location: Ingénierie des Matériaux Polymères IMP UMR 5223 CNRS, INSA-Lyon, Villeurbanne, France

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Skill set required : PhD in Polymer Physico-Chemistry or Soft Matter Processes & Engineering, with sufficient expertise in Colloids & Dispersions