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ROUGHNESS MODELING IN THE PAVEMENT LAYERS INTERFACES

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The interfaces between the bituminous pavement layers represent a very important parameter for the computational and design of these structures. However, the bonding quality depends on binder properties, adhesion state and surface cleanliness [1]. Some research [2] [3] shows the influence of the surface roughness between the different layers on the mechanical behavior of the interfaces in these structures. In fact, roughness and adhesion state is related to the specific surface and the contact surface at the interface between layers.

For providing reliability and efficiency of the pavement design methods a modeling study is required. Especially in this area the modeling interface is considered in most cases perfectly bonded with a local behavior based on empirical fatigue laws or fracture mechanics such as elastoplastic Mohr-Coulomb laws [4][5] without taking into account roughness geometrical parameters. However, in composite materials field, cohesive zone models [6, 7, 8] as well as asymptotic methods and theoretical studies [9] have been developed to simulate interlaminar degradation and delamination. Materials and interface behaviors can be elastoplastic, viscoelastic, with coupling damage [6, 7]. Few models focus on cyclic and fatigue loadings [8, 10].

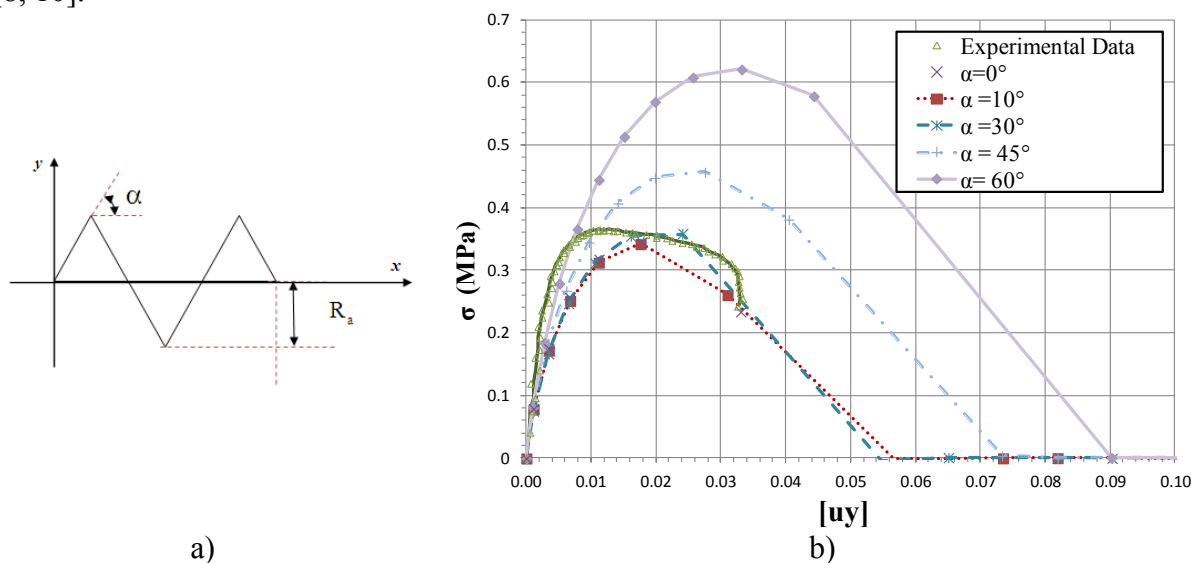


Fig.1. a) Roughness profile b) Stress-Relative normal displacement of the interface.

This paper is based on damage cohesive zone models [7, 9] applied to study debonding and degradation of a pavement interface. In a first part, monotonic tensile and double shear tests are performed, in order to obtain interphase and interface mechanical parameters. Digital image correlation (DIC) methods allow identification of uncoupled interface stiffness (k_n and k_s), damage evolutions, critical energy release rate. Experimental global and R_a mean depth roughness measurements are inputs parameters for the geometrical modeling, at interface macroscale.

The second part, consist in studying the influence of theses interface parameters and coupling effect through a numerical analysis. The interface damage model proposed by [7] implemented in the industrial computing code Cast3M is used. For this study, several cases of inclination angle α (Fig.1.) are tested, with mean depth roughness R_a , in order to determine the influence of the roughness on the mechanical behaviour of interface and adhesion between different layers.

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