

Deterministic models of interfaces with damage: an asymptotic study

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In recent years, adhesive bonding became a very common assembly technique in many industrial sectors, such as aeronautical, civil, energetic, automotive and biomedical engineering, as an alternative to conventional joining techniques, such as welding and riveting. Adhesive bonding provides several advantages, including reduced stress concentrations, higher corrosion resistance, water tightness, and the ability to join materials with dissimilar properties. In this lecture, a general model of imperfect interfaces is presented. This model includes hard (the stiffness of the adhesive is of the same order as that of the substrates) or soft (the stiffness of the adhesive is lower than that of the substrates) interfaces. The model takes into account a damage parameter. The initial material considered is obtained by homogenization a micro-cracked material taking into account the shape of the pores (strain or stress approach). The porosity of the medium is chosen as the damage parameter, as justified by experimental observations. An evolution law based on the standard material theory is introduced. Academic examples are presented to show the evolution of the mechanical parameters and the relevance of the model.