NUMERICAL SIMULATION OF ABLATION OF A CARBON-PHENOLIC COMPOSITE VIA AN INTERFACE TRACKING METHOD

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ABSTRACT Composite materials are vastly employed in rocket nozzle extensions and as thermal protection shields in aerospace industry. In this work, the two-dimensional computational simulation of the ablative process in a carbon-phenolic composite used in rocket thermal protection systems is presented. The numerical method employs an interface tracking method that uses two different grids, an Eulerian mesh for the whole domain and Lagragian meshes for every moving interface, allowing the characterization of the discontinuities between the material phases produced during the ablation process. The ablative model considers the presence of two simultaneous moving fronts, the pyrolysis and char fronts. The results are compared with some experimental data for carbon-phenolic resin samples exposed to a plasma jet, showing a much better agreement than the traditional one-front model. Such procedure will allow a more accurate dimensioning of rocket thermal protection systems, contributing for project optimization.