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Controlling Interfacial Separation in Porous Structures by Void Patterning AHMED GHAREEB, AHMED ELBANNA, Univ of Illinois - Urbana — Manipulating interfacial response for enhanced adhesion or fracture resistance is a problem of great interest to scientists and engineers. In many natural materials and engineering applications, an interface exists between a porous structure and a substrate. A question that arises is how the void distribution in the bulk may affect the interfacial response and whether it is possible to alter the interfacial toughness without changing the surface physical chemistry. In this paper, we address this question by studying the effect of patterning voids on the interfacial-to-the overall response of an elastic plate glued to a rigid substrate by bilinear cohesive material. Different patterning categories are investigated; uniform, graded, and binary voids. Each case is subjected to upward displacement at the upper edge of the plate. We show that the peak force and maximum elongation at failure depend on the voids design and by changing the void size, alignment or gradation we may control these performance measures. We relate these changes in the measured force displacement response to energy release rate as a measure of interfacial toughness. We discuss the implications of our results on design of bulk heterogeneities for enhanced interfacial behavior.

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