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How does adhesion impact the formation of telephone cord buckles? ETIENNE BARTHEL, JEAN-YVON FAOU, SERGEY GRACHEV, CNRS / Saint-Gobain, GUILLAUME PARRY, SIMAP — Compressively stressed thin films with low adhesion frequently buckle into telephone cords. Although telephone cord buckles have been studied for decades, no complete understanding of their origin and propagation has so far been presented. Here, using Finite Element Analysis, we have coupled non-linear plate deformation with a cohesive zone model to simulate the kinematics of a propagating telephone cord buckle. On the experimental side, we have developped model thin films with a precise adjustment of both adhesion and residual stresses. From the comparison of the simulations with some experimental observations, we propose a generic mechanism for the formation of telephone cord buckles. Proper inclusion of the dependence of interfacial toughness upon mode mixity proved to be central to the success of the approach so that this clarification of the mechanism of telephone cord formation promises better understanding of interfacial toughness through the analysis of buckle morphology.

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