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Worn Stones with Flat Sides - All Time Regularity of the Interface

We study the all time regularity of the free-boundary problem associated to the deformation of a compact weakly convex surface Σ in $\mathbb{R}^3$, with a flat side, by its Gaussian Curvature. We show that under certain necessary regularity and non-degeneracy initial conditions the interface separating the flat from the strictly convex side, remains smooth on $0 < t < T_c$, up to the vanishing time T_c of the flat side. We also study the limiting shape of the interface and the regularity of the interface at the time T_c.