Real Analytic Solutions of the Surface Diffusion Flow

The problem of the surface diffusion flow is to look for a moving hypersurface $\Gamma(t)$ embedded in $\mathbb{R}^{m+1}$ and evolving subject to the geometric evolution law that the normal velocity equals the Laplace-Beltrami acting on the mean curvature. By parametrizing it on a reference manifold, it leads to a fourth order nonlinear evolution equation. We can show by means of a parametrized diffeomorphism on the reference manifold and the implicit function theorem that there exists a unique local real analytic solution $\{\Gamma(t) : t \in [0, T)\}$ for some $T > 0$ in the sense that $\cup_{t\in(0,T)}\Gamma(t) \times \{t\}$ is a real analytic submanifold in $\mathbb{R}^{m+2}$.