1016-35-110 **Huiqiang Jiang*** (hqjiang@math.umn.edu), 127 Vincent Hall, 206 Church St. S.E., Minneapolis, MN 55414, and **Christopher Larsen**. *Analyticity for a two dimensional free boundary problem with volume constraint.*

Let Ω be a bounded domain in $\mathbb{R}^n$, $n \geq 2$ and $\mathcal{M}_\Omega$ be the collection of all pairs of (A, u) such that $A \subset \Omega$ is a set of finite perimeter and $u \in H^1(\Omega)$ satisfies $u(x) = 0$ a.e. $x \in A$. We consider the energy functional

$$E_\Omega(A, u) = \int_\Omega |\nabla u|^2 + P_\Omega(A)$$

defined on $\mathcal{M}_\Omega$, where $P_\Omega(A)$ denotes the perimeter of A inside Ω.

Let $n = 2$ and (A, u) be a local minimizer under given volume constraint, we show that ∂A is analytic and u is locally Lipschitz. (Received February 06, 2006)