A diffused interface whose chemical potential lies in a Sobolev space

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Abstract. We study a singular perturbation problem arising in the scalar two-phase field model. Given a sequence of functions with a uniform bound on the surface energy, assume the Sobolev norms $W^{1,p}$ of the associated chemical potential fields are bounded uniformly, where $p > \frac{n}{2}$ and n is the dimension of the domain. We show that the limit interface as ε tends to zero is an integral varifold with a sharp integrability condition on the mean curvature.