1154-35-1040 **Zachary J. Hilliard*** (zachary.hilliard@wsu.edu), Department of Mathematics and Statistics, Washington State University, PO Box 643113, Pullman, WA 99164-3113, and **Lynn Schreyer** and **Nikolaos Voulgarakis**. *An Anisotropic Cahn-Hilliard Equation with Variable Mobility and Gravity Potential.*

When considering the variable mobility case, the Cahn-Hilliard equation can be viewed as either a 4th-order semi-linear partial differential equation or as a system of second order partial differential equations of the form

$$u_t = \nabla \cdot b(u) \nabla w$$
$$w = f(u) - \alpha \Delta u,$$

where f is generally taken to be the derivative of a double well potential function, $\alpha > 0$, and the function b is bounded away from zero in the non-degenerate case. Here we analyze a generalization of this equation of the form

$$u_t = \nabla \cdot b(u) \mathbf{K} \nabla w$$
$$w = f(u) - \alpha \Delta u + \phi.$$

When viewing this equation from the porous media perspective, u represents density, $b(u)\mathbf{K}$ conductivity, w the gravi-chemical potential, and ϕ the gravity potential. We present various properties of this equation which are demonstrated with numerical examples as well as proving the existence of a weak solution when taking no-flux boundary conditions on both u and w. (Received September 12, 2019)