1056-35-235 **Andrea Catalina Rubiano*** (arubiano@purdue.edu), 203 Montifiore St, Apt 309, Lafayette, IN 47905. *On stable states in a coupled energetic model for incompressible nematic elastomers.*

We investigate an energetic model for incompressible nematic elastomers that combines the energy density developed by Bladon, Warner and Terenjtev with the classical energy density from Landau - de Gennes theory for uniaxial nematic liquid crystals. A unit-length molecular director of the nematic elastomer and an incompressible deformation are the unknown functions, minimizers of the coupled energy. Based on physical experiments, we consider the problem of a thin domain in R^3 clamped on its sides that is being stretched perpendicular to its original director. In contrast to previous mathematical works in this field, the molecular director is not assumed to be constant throughout the domain. After establishing a suitable energetic model for this situation, we prove lower semi-continuity of the energy and the existence of minimizers. Keeping the restriction of incompressibility on the deformation and unit length of the director, we derive weak Euler Lagrange equations satisfied by the minimizers. Additionally, we consider the reduction of the model to a 2-dimensional one and deduce existence results for non-convex energy densities involving a penalization on the volume constraint. In this case we also find weak Euler-Lagrange equations and prove a partial regularity result. (Received September 10, 2009)