1176-49-177 **Olalekan A Babaniyi*** (obsma@rit.edu), 84 Lomb Memorial Drive, Rochester, NY 14623, **Assad A Oberai** (aoberai@usc.edu), 3650 McClintock Ave., Los Angeles, CA 90089, and **Paul E Barbone** (barbone@bu.edu), 730 Commonwealth Ave, brookline, MA 02215. *Direct error in constitutive equations formulation for inverse diffusion and elasticity problems.*

We consider an inverse diffusion problem: Given ϕ, find κ such that $\nabla \cdot (\kappa \nabla \phi) = 0$. Stable variational formulations exist for this problem treated as a first-order hyperbolic system for κ [**?**, **?**] . The smoothness requirements for these approaches are overly restrictive, however, and are ill-suited to the inverse problem. We present a new mixed variational formulation for the inverse diffusion problem that allows the solution and derivatives of the data to be in $L(\Omega)$. The formulation is a quadratic optimization problem based on minimizing the error in constitutive equations, and can be solved directly (ie. without iterations) for the unknown parameters. We prove that this formulation is well-posed for inverse diffusion with mild conditions on the data. We show through computational examples that a stabilized Galerkin discretization converges with mesh refinement. Finally, we extend the formulation to inverse elasticity and show promising computational results in this system. (Received January 21, 2022)