1071-65-37 **Fatih Celiker*** (celiker@math.wayne.edu), Wayne State University, Department of Mathematics, 656 W. Kirby, Detroit, MI 48202, and **Bernardo Cockburn** and **Ke Shi**.

Hybridizable discontinuous Galerkin methods for higher order partial differential equations.

We introduce a new hybridizable discontinuous Galerkin (HDG) method for solving higher order elliptic and parabolic problems. We first develop the framework on the model biharmonic problem $\Delta^2 u = f$. We rewrite the biharmonic problem as a first order system for separate unknowns u, ∇u, Δu, and $\nabla\Delta u$, then we introduce the HDG method for which the only globally coupled degrees of freedom are those of the approximation to u and Δu on the faces of the elements. Therefore, the methods are efficiently implementable. We display numerical results which indicate that a suitable choice of the numerical traces results in optimal convergence for all the unknowns except for the approximation to $\nabla\Delta u$ which converges with order $k + 1/2$ when polynomials of degree at most k are used. We then show how our framework can be generalized in a straightforward fashion to more challenging problems such as the Reissner-Mindlin plate model. We also show how the method can be applied to time-dependent problems as well as higher (even) order partial differential equations. (Received January 23, 2011)