1125-76-2696 **Sourav Dutta*** (sdutta@math.tamu.edu), Texas A&M University, Department of Mathematics, 3368 TAMU, College Station, TX 77843-3368, and **Prabir Daripa**. *A numerical study of immiscible two-phase multicomponent flows in highly heterogeneous porous media.*

We will present a fast and efficient approach for solving a coupled system of elliptic and parabolic equations arising in the context of multiphase flows in porous media. Such flows are found in many different physical applications which include enhanced oil recovery processes, subsurface flows and bio-fluid flows. A new global pressure function for incompressible, multicomponent, immiscible two-phase flows will be introduced. The system of equations using the global pressure model is not as strongly coupled as the models which use the phase pressures as simulation variables. This system is numerically solved using a modern, hybrid method based on a combination of a discontinuous non-traditional finite element formulation and a time-implicit finite difference scheme based on the modified method of characteristics. Results of a theoretical convergence study and numerical comparisons with an exact solution and also with existing literature will be presented. We will conclude with a discussion of the effect of various chemical components and of the heterogeneity of the domain properties on the spontaneous formation of finger patterns and other complex flow characteristics. (Received September 20, 2016)