1046-35-1416 **Arian Novruzi*** (novruzi@uottawa.ca), Department of Mathematics, University of Ottawa, 585 King Edward Avenue, Ottawa, ON K1N 6N5, Canada, and **Al-Arydah Mo'Tassem**. *Existence of positive solutions to a nonlinear PDE system, modeling fuel cell dynamics near a triple phase boundary*

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We consider a 2d PDE nonlinear system coupling two variables in three different domains: vapour in a 2d air domain (air pore) and water in 2d porous domain (ionomer) and in a 1D domain. It is a simplified version of a mathematical model representing the distribution of gases near a triple phase boundary in catalyst layer of hydrogen fuel cells, in undersaturated regime.

To note that the system involves singular boundary data which couple the diffusion between 2d and 1d domains. Furthermore, the 1d equation is a limit of a reaction-diffusion-migration equation in a thin 2d domain, when the width of the domain tends to zero.

Under precise conditions on boundary data, we establish several a priori estimates, and we prove the existence of a positive solution following a fixed point argument.

Finally we consider numerically the validity of our model by comparing the solution of our limit model (involing 1d equation) with the original one which instead involves a thin 2d domain. (Received September 15, 2008)