The 18th International Conference on Finite Elements in Flow Problems (FEF2015)
16-18 March 2015, Taipei, Taiwan

MODELING OF COUPLED SYSTEMS OF COMPLEX FLUIDS AND SOLIDS USING PHASE FIELDS

Hector Gomez[1]

[1] Universidade da Coruña,
Department of Mathematical Methods,
Campus de Elviña, s/n, A Coruña
hgomez@udc.es

Key Words: *Phase fields, Complex fluids, Fluid-structure interaction.*

There is a large body of literature dealing with the interaction of solids and classical fluids [1], but the interaction of solids and complex fluids remains practically unexplored, at least from the computational point of view.

Complex fluid is a broad term used to describe, for example, multi-component or multi-phase fluid mixtures, emulsions or foams. Complex fluids produce much richer physics than classical fluids when they interact with solids, especially at small scales. In this presentation, I will illustrate this point by studying several physical phenomena in which the interaction of complex fluids and solids plays a key role, such as, for example, phase-change-driven implosion.

From a methodological point of view, I will use a phase-field model to describe the complex fluid, and classical nonlinear hyperelasticity to model the solid. Our computational framework is based on Isogeometric Analysis [2], which allows for a straightforward discretization of the higher-order partial differential operators typically present in complex-fluid theories [3,4].

REFERENCES

[1] Bazilevs Y, Takizawa K, Tezduyar TE (2013) Computational Fluid-Structure Interaction: Methods and Applications, Wiley Series in Computational Mechanics.
[2] Hughes TJR, Cottrell JA, Bazilevs Y (2005) Isogeometric Analysis: CAD, finite elements, NURBS, exact geometry and mesh refinement, *Comput Meth Appl Mech Eng* **194**:4135-4195.
[3] Gomez H, Hughes TJR, Nogueira X, Calo VM, *Comput Meth Appl Mech Eng*, **199**:1828-1840.
[4] Gomez H, Calo VM, Bazilevs Y, Hughes TJR *Comput Meth Appl Mech Eng*, **197**:4333-4352.