

Summary of my impression of the academic quality of the research presented during my visit of SUBPRO on Feb 20<sup>th</sup> 2019 - Jean-Francois Argillier

### **Overall impression**

The research projects that were presented are of very high quality, at the front edge of the international research in the field. They clearly enable development of new knowledge and lead to scientific innovation. The scientific approach is globally very convincing with combination of experimental works using original home build pieces of equipment and simulation works, as well as multiscale studies (from microscopic level up to macroscopic scale and even flow loop scale). Motivation and implication of PhDs students and postdoc is impressive. Publication records of teams are excellent. One of the strength of SUBPRO that could be used more intensively in my opinion is to have in the same center people having on one side fluid mechanics expertise and the other side physico-chemistry expertise with deep knowledge on interfacial properties of real crude system. Stronger interactions between the groups could be beneficial.

### **Impression on the projects presented and new projects**

**Subprojects 2.7, 2.6, 2.6b** ( droplet breakage) : impressive design of the test rig, that needs a lot a precision, like the synchronisation of the 2 cameras, and many tests to do statistics. Overall they are excellent low TRL projects. Coupling the instability model with conventional particle breakage is very challenging. One question maybe: how could the results be practically used to optimize the entrance of a separator? Impact of interfacial rheology, due to indigenous surfactants as in a real crude would be very interesting (by adding for example naphthenic acids or asphaltene in a model oil as a first step, before using a real crude...)

**Subproject 2.1b** (produced water): outstanding microfluidic device enabling to study crude oil droplets coalescence with micron size droplet sizes as well as interaction between bubbles and droplets. Very nice work dealing with impact of production chemicals on coalescence. Excellent presentation (6) /publication (4 papers) list

*New project N4a*: Gas flotation for subsea produced water treatment. This seems to me a very judicious project aiming at performing systematic studies of oil and solids removal by gas flotation in P/T conditions. Comparison between bubbles/ droplets micro scale studies using microfluidic and gas flotation rig is very interesting and will undoubtedly lead to new knowledge.

**Subproject 2.2** (wax) : excellent project leading to better understanding on wax crystallization and interaction between wax and PPD and asphaltenes. 6 papers published or ready to be, impressive !!

*New project N4b*, in the continuity of the former project, aims at getting a better characterization and quantification of the interactions between waxes, asphaltenes and wax inhibitors using AFM and NMR. This is an interesting project but the experiment using the Atomic Force microscope does not sound straight forward to me in terms of representativity of the actual phenomenon and might need to be carefully designed in order to deliver the information looked for (deposition of the layers, sequences, kinetics....)

**Subproject 2.9** ( compact separation flow loop): Very impressive MPPS design and prototype! The *New project N7* aiming at solving the uneven splitting within the MPPS is very interesting. Coupling experiment using the flow loop and CFD simulation will clearly enable to better describe the phenomena and predict separation efficiency. Studying the impact of surfactant simulating a real crude (instead of model oil) will be very useful as it will enable to get closer to the reality.