Proposal to create a new ***"Condensed Phase Phenomena"*** subgroup within the ***"IAFSS International Working Group on Measurement and Computation of Fire Phenomena"*** (MaCFP Working Group).

Background

The MaCFP Working Group and workshop series was created in 2015 and the call for participation in the first workshop was issued in April 2016. Continuously updated information on the MaCFP Working Group effort can be found at: http://www.iafss.org/macfp/

It is proposed that the MaCFP Working group be expanded to include a subgroup dedicated to advance understanding of thermal decomposition and pyrolysis in support of predictive fire modeling. The expanded MaCFP will consist of two subgroups:

1. the Gas Phase Phenomena subgroup (consisting of the current MaCFP Working Group); and
2. the Condensed Phase Phenomena subgroup.

Motivation

The production of combustible gases by burning materials is typically the rate-limiting process in the growth of fire. A quantitative understanding of this process is therefore essential for advancing our ability to predict and mitigate fire development. Unfortunately, measurement and modeling efforts carried out in this field by various research groups tend to be poorly coordinated. Little agreement exists as to what constitutes best practices and standards in data collection and model development. The purpose of the Condensed Phase Phenomena subgroup is to facilitate data sharing among researchers in order to improve predictions of thermal decomposition and pyrolysis in fire. The work of this subgroup, in conjunction with the work of the Gas Phase Phenomena subgroup, will lead to fundamental progress in fire modeling. It is envisioned that the two subgroups will collaborate to make quantitative predictions of the combined gas-solid phase phenomenon of flame spread. As with the original MaCFP working group, each subgroup would continue with joint workshops every two years beginning in 2017.

Objectives

The Condensed Phase Phenomena subgroup shares the central objective of MaCFP "to target fundamental progress in fire science and to advance predictive fire modeling." The specific objectives of the subgroup will focus on the development, calibration, verification, and validation of predictive models of thermal decomposition and pyrolysis. To this end, the subgroup plans to:

- Develop several alternative formats for experimental data sets that carry sufficient information to enable parameterization of pyrolysis models for a given material.
- Develop a set of requirements for data set quality and completeness and organize a committee of experts that will review the submissions to the repository to ensure that they are compliant with these requirements.
- Incorporate compliant data sets into the existing MaCFP data repository (https://github.com/MaCFP).
- Create a database of pyrolysis property sets that are generated from the experimental data sets. Each pyrolysis property set will be required to be accompanied by a demonstration of how well it captures the data on the basis of which it was calibrated and validated.
- Develop a set of minimum requirements for numerical pyrolysis simulation codes.
- Organize a discussion group focused on unresolved issues in pyrolysis modeling.

The scientific topics covered by the subgroup will include:

- Kinetics and thermodynamics of the condensed phase decomposition reactions.
- Properties and composition of gaseous pyrolyzates.

- Heat and mass transfer in the condensed phase.
- Physics and chemistry of the gas–condensed phase interface including the topics of oxidative pyrolysis and interactions with the surface flame.
- Coupled thermal and mechanical behavior of pyrolyzing solids including intumescence and melt flow.

Format, audience and funding

We envision a half day planning meeting that would be organized as part of the first MaCFP Workshop and immediately before the 12th IAFSS Symposium in Lund, Sweden. This planning meeting would be opened to all interested persons. A call to participation will be included in the MaCFP Workshop advertisement campaign. The planning meeting will define the objectives and focus areas of the Condensed Phase Phenomena subgroup as well as define a tentative program for the second MaCFP Workshop (in 2019).

The organizing committee for the planning meeting is composed of Morgan Bruns (National Institute of Standards and Technology, USA), Thomas Rogaume (University of Poitiers, France) and Stanislav Stoliarov (University of Maryland, USA).

The proposed format of the planning meeting is the following: 7 speakers will be selected and invited by the organizing committee; after a general description of the objectives of the meeting by the organizing committee, each invited speakers will be asked to make a 20 minute oral presentation followed by a 10 minute open discussion; members of the organizing committee will then provide a synthesis of the presentations and discussions with the objective to identify the specific topics that should be featured in the second MaCFP Workshop. The presentations will be dedicated to a description of the state of the art and the needs of the condensed phase models currently used in fire research, materials science and engineering applications.

Proceedings will be edited and put online on the website of MaCFP. The proceedings are intended to review progress, summarize the accomplishments of the planning meeting and provide guidance with clear objectives for the next workshop.

The target audience is the experimental and computational fire research community on the general topic of thermal decomposition and pyrolysis modeling for fire safety applications. We envision an audience of approximately 50 researchers.

To encourage participation, we propose to hold the planning meeting without a registration fee. Participants will be expected to fund their own travel expenses. The organizing committee will work with the MaCFP Co-Chairs and look for sponsorship in order to support operational costs (rental of meeting space, catering of meals and coffee breaks, *etc*).

This proposal was produced by a Task Group that was formed (informally) following discussions that took place in April 2016 and after different discussions with the Co-Chairs of MaCFP task group.

Organizing Committee

The organizing committee of the Condensed Phase Phenomena subgroup is composed of:

Morgan Bruns (National Institute of Standards and Technology, USA)

Thomas Rogaume (University of Poitiers, France)

Stanislav Stoliarov (University of Maryland, USA)

with the Co-Chairs of the organizing committee of the MaCFP Working Group:

Bart Merci (Ghent University, Belgium)

Jose L. Torero (University of Queensland, Australia)

Arnaud Trouvé (University of Maryland, USA)