

## **Session Overview: Heterogeneous Combustion**

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Heterogeneous combustion is a very broad term which normally refers to two phase combustion. Examples include spray combustion, particle combustion such as coal and catalytic combustion. Catalysts can play a number of roles in the combustion process such as in catalytic flame synthesis of novel materials, synthesis of catalytic materials in flames and in catalytic combustion. For example, catalytic combustion is critical for rapid propulsion, which is necessary for SCRAM jets. A grand challenge in heterogeneous systems including combustion and catalysis is the ability to do real-time, spatially resolved measurements of real multiphase and multiscale systems. Synchrotron X-ray techniques are well positioned to play an important role in this challenge.

In this session, a number of approaches to understanding heterogeneous systems are presented. Barney Ellison examines the role of organic radicals in the high temperature pyrolysis of furans using in situ X-ray and spectroscopic techniques which provide insight into the dynamics of the pyrolysis reactions. Next, Xiaolin Zheng will discuss the flame synthesis of binary metal oxide nanowires which can be used for anodes in photoelectrochemical water-splitting. In situ characterization of catalytic processes by X-ray spectroscopic techniques to better understand the fundamental reaction mechanisms will be presented by Chris Marshall. Finally, Karina Chapman will discuss the renaissance of the X-ray pair distribution function (pdf) method and its role in probing reactivity of heterogeneous systems.