**A New Strategy for the Development of Renewable Fuels: Co-optimization of Fuels and Engines**

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**Abstract**

The Co-Optimization of Fuels & Engines (Co-Optima) initiative started to aim to simultaneously investigate advanced engine designs and the enabling fuel properties in order to maximize vehicle performance and energy efficiency, minimize environmental impact, and accelerate widespread adoption of innovative combustion strategies. This research and development (R & D) collaboration between the U. S. Department of Energy (DOE) with 2 offices (Bioenergy Technologies (BETO) and Vehicle Technologies Offices (VTO)), 9 national laboratories, 13 universities and numerous industry and government stakeholders is a first-of-its-kind effort to combine biofuels and combustion R & D, building on decades of advances in both fuels and engines not only the near-term improvements to the types of fuels and engines currently on the road, but also to the development of revolutionary engine and fuel technologies for a longer-term, higher-impact series of solutions.
In this talk, we will show how these collaborations work to design engines to be more efficiently and affordable, scalable, and  better with sustainable fuels and fuels to work in high-efficiency, low-emissions engines.

Especially, emissions effect from the one of fuel properties using sooting tendency will be discussed in more details. The sooting tendency of the fuel is important because it strongly affects particulate formation and emissions from practical combustion devices. The tendency of candidate bio-based fuel blendstocks to produce soot in both internal and external combustion engines, and other combustion system is a significant constraint in screening compounds for consideration as new fuels, especially next generation biofuels. Our work will provide a straightforward and high throughput framework for assessing the viability of potential bio-blendstocks and other new fuels, as potentially high-sooting species can be screened directly from molecular structure.