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**Fuel wall film effects on flame quenching and emissions in Gasoline Direct Injection (GDI) engines**[1] SWAPNIL DESAI, TUAN MINH NGUYEN, JACQUELINE CHEN, Sandia National Laboratories — The thermal efficiency and power output of Gasoline Direct Injection (GDI) engines have improved dramatically in recent years. Yet, these engines still suffer from relatively higher soot and unburned hydrocarbon (UHC) emissions. The injection of liquid fuel in GDI engines causes formation of a liquid film on the combustor wall, especially during cold start. This can cause fuel rich zones to form in the near-wall region which could fundamentally affect flame structure and lead to quenching. In this work, the interaction of a laminar premixed flame and a fuel wall film is studied using 1D direct numerical simulation with complex chemistry and transport under constant volume conditions. Fuel vaporization off the wall film is implemented as a boundary condition by using an analytical function which takes flame position into account. Parametric studies are conducted with various initial temperature of 500 to 650 K and pressures of 7 to 15 bar at a constant wall temperature of 400 K. Since gasoline usually consists of multiple hydrocarbon components, the fuel wall film composition is varied systematically to understand the effect on flame quenching characteristics. Emissions of UHC and soot precursors before and after flame quenching are also investigated in detail.

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