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The terminal edge structure of a transcritical interface between two propellant streams at high pressures JAVIER URZAY, Center for Turbulence Research, Stanford University, LLUIS JOFRE, Center for Turbulence Research, Stanford University; and UPC-Barcelona Tech, Barcelona (Spain) — A theory of the transcritical hydrodynamics of propellants in high-pressure combustors is presented in this talk. This theory couples the multicomponent Navier-Stokes conservation equations with an extension of the diffuse-interface theory of van der Waals, and is supplemented with a high-pressure equation of state and appropriate redefinitions of the thermodynamic potentials. This theory predicts the formation of a transcritical interface between the fuel and coflow propellant streams that persists downstream of the injection orifice over a supercriticalization distance of the same order as the characteristic thermal-entrance length of the fuel stream. The transcritical interface vanishes at an edge, where the diffusional critical point plays a fundamental role in the dynamics. A fully supercritical mixing layer emanates from the edge, across which the propellants mix by molecular diffusion as if they were gas-like fluids.

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