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Effects of differential diffusion on the flame structure of oxygen enhanced turbulent non-premixed jet flames[1] FELIX DIETZSCH, MICHAEL GAUDING, CHRISTIAN HASSE, TU Bergakademie Freiberg — By means of Direct Numerical Simulation we have investigated the influence of differential diffusion for non-premixed oxygen-enhanced turbulent flames. Oxygen-enhanced conversion usually yields higher amounts of H2 as compared to conventional air combustion. It is well known that H2 as a very diffusive species leads to differential diffusion effects. In addition to the diffusive transport mixing processes are also often controlled by turbulent transport. Previous investigations of a turbulent CH4/H2 oxygen-enhanced jet flame have shown that in mixture fraction space it is important to distinguish between regions of equal diffusivities and detailed transport. These findings are of particular interest when performing Large-Eddy simulations applying a flamelet approach. Using this approach a LES study was performed of the aforementioned flame considering differential diffusion. Therefore, flamelet equations including differential diffusion via non-unity constant Lewis numbers were solved. However, this study showed that keeping the non-unity Lewis numbers constant, is not sufficient to capture the diffusion phenomena in this particular flame. Direct Numerical Simulations have been conducted in order to investigate how Lewis numbers are affected in mixture fraction space.

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