

1F02: EFFECT OF FUEL TYPE ON THE EXTINCTION OF FUEL AND AIR STREAM DILUTED PARTIALLY PREMIXED FLAMES.

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I wonder whether the stabilization of the acetylene flames with increasing CO₂ addition might be due to carbon dioxide acting as an oxidizer in this environment. For instance, the overall reaction $2\text{C}_2\text{H}_2 + 2\text{CO}_2 \rightarrow \text{C}_2\text{H}_4 + 4\text{CO}$ yields about 8 kcal per mole of acetylene consumed. For most other fuels, the reaction with CO₂ is endothermic, since their heats of formation are much less than for acetylene. This might explain why acetylene behaves differently than other fuels.

Reply by Andrew Lock

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We greatly appreciate this comment. There is a good possibility that CO₂ may be acting as an oxidizer in these cases. Since the overall reaction $2\text{C}_2\text{H}_2 + 2\text{CO}_2 \rightarrow \text{C}_2\text{H}_4 + 4\text{CO}$ is not included in the GRI-3.0 mechanism used in our simulation, the investigation of this aspect will require more work. We plan to examine this possibility in our future work.