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The effect of H₂S addition to methane on the ignition and oxidation at high pressures

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Experimental: Laminar Flow Reactor (FR)
- Temperature: 600—900 K
- Pressure: 50 bar
- Flow rate: 3.0 NL/min → Residence time: 6.6—10 s
- Downstream measurement via GC and Gas Analyzer
- H₂S/CH₄/O₂/N₂ mixtures (Φ = 22.8, H₂S/CH₄ = 1.6% & Φ = 1.1, H₂S/CH₄ = 13.5%)

Experimental: Rapid Compression Machine (RCM)
- Temperature: 930—1050 K
- Pressure: 30—80 bar
- H₂S/CH₄/O₂/N₂/AR mixtures (Φ = 0.5, H₂S/CH₄ = 0 & 1 %)

Chemical Kinetics Model
- H₂/CO/HC’s subsets from recent work by Glarborg et al. [1—3].
- H₂S subset is taken from a recent review by Glarborg et al. [4].
- Importance of SH+H₂O₂ = H₂S+HO₂ (R1) → calculated by Zhou et al. [5], adjusted by Mathieu et al. [6].

Results (RCM)
- Adding 1% H₂S to CH₄: reducing ignition delays by a factor of two.
- Good prediction by the model
- Promoting effect of H₂S addition on CH₄ oxidation
- Overestimation of the onset of CH₄ and H₂S oxidation by the model
- ROP & SEN: no change in reaction pathways of CH₄ by adding H₂S
- → H₂S interactions with H₂/O₂ promote the ignition by producing radicals

Results (FR)
- Sensitivity of Conversion

Summary & Future Work
- RCM: Adding 1% H₂S to CH₄, reducing ignition delays by a factor of two.
- Good prediction by the model
- FR: Promoting effect of H₂S addition on CH₄ oxidation
- Overestimation of the onset of CH₄ and H₂S oxidation by the model
- ROP & SEN: no change in reaction pathways of CH₄ by adding H₂S
- → H₂S interactions with H₂/O₂ promote the ignition by producing radicals
- Further work is required for better understanding of intermediate-T/high-P oxidation of H₂S and its interaction with CH₄.

References