Existence analysis of a stationary compressible fluid model for heat-conducting and chemically reacting mixtures

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The existence of large-data weak solutions to a steady compressible Navier–Stokes–Fourier system for chemically reacting fluid mixtures is proved. General free energies are considered satisfying some structural assumptions, with a pressure containing a γ-power law. The model is thermodynamically consistent and contains the Maxwell–Stefan cross-diffusion equations in the Fick–Onsager form as a special case. Compared to previous works, a very general model class is analyzed, including cross-diffusion effects, temperature gradients, compressible fluids, and different molar masses. A priori estimates are derived from the entropy balance and the total energy balance. The compactness for the total mass density follows from an estimate for the pressure in L^p with $p > 1$, the effective viscous flux identity, and uniform bounds related to Feireisl's oscillations defect measure. These bounds rely heavily on the convexity of the free energy and the strong convergence of the relative chemical potentials. The presentation follows the publication [1].

References

[1] M. Bulíček, A. Jüngel, M. Pokorný, N. Zamponi, *Existence analysis of a stationary compressible fluid model for heat-conducting and chemically reacting mixtures*, J. Math. Phys. **63** (2022), no. 5, Paper No. 051501, 48 pp.