

Oberseminar Numerik

Prof. Dr. Ansgar Jüngel (TU Wien)

30.06.25 14:15 Uhr Hilbertraum 05-432 Staudingerweg 9, 55128 Mainz

"Finite-volume methods for cross-diffusion systems and discrete chain rules"

Abstract:

Many thermodynamic mixture and biological multicomponent models can be described by cross-diffusion systems. Although the diffusion matrices are generally neither symmetric and nor positive definite, the systems often possess an entropy (or free energy) structure. We aim to "translate" this entropy structure to two-point approximation finite-volume discretizations. The main difficulty is to adapt the nonlinear chain rule to the discrete level.





AG Numerik

Institut für Mathematik Staudingerweg 9 55128 Mainz

Sekretariat: burkertb@mathematik.uni-mainz.de



In this talk, we present two strategies to define a discrete chain rule, assuming either that the entropy is the sum of individual entropies or that the entropy describes volume-filling models. Both strategies use suitable mean formulas, based on the mean-value theorem and the convexity of the entropy functional. This leads to convergent and structure-preserving finite-volume schemes. Examples include models for segregating populations and Maxwell-Stefan systems for gas mixtures

Hierzu sind alle herzlich eingeladen.



