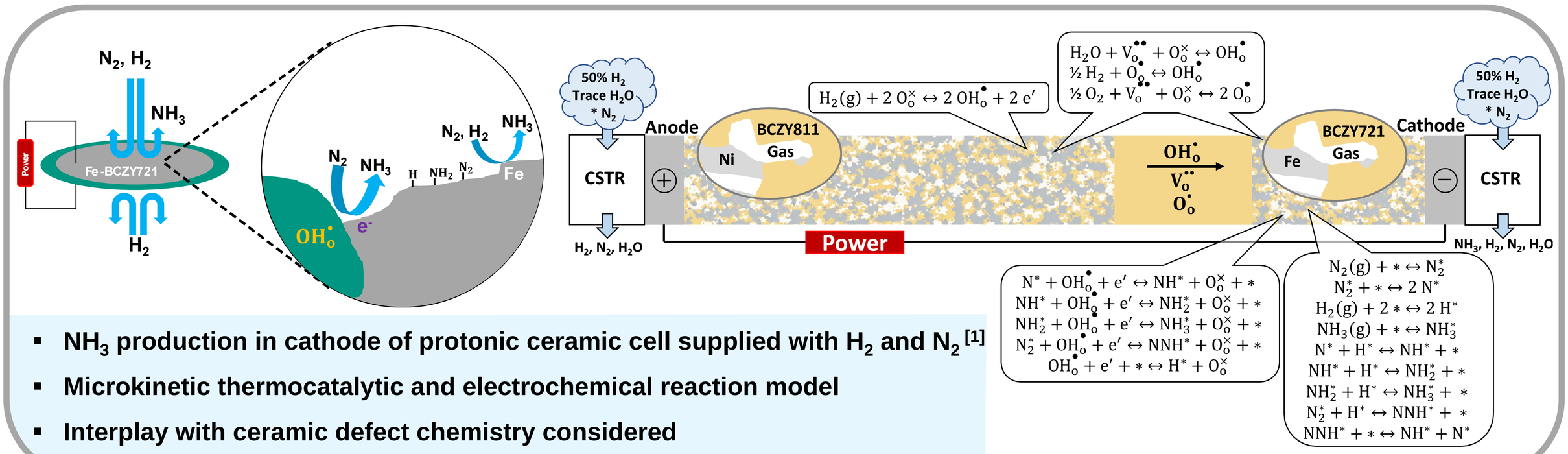
[1] KIT – Institute for Chemical Technology and Polymer Chemistry
[2] CSM – Department of Mechanical Engineering

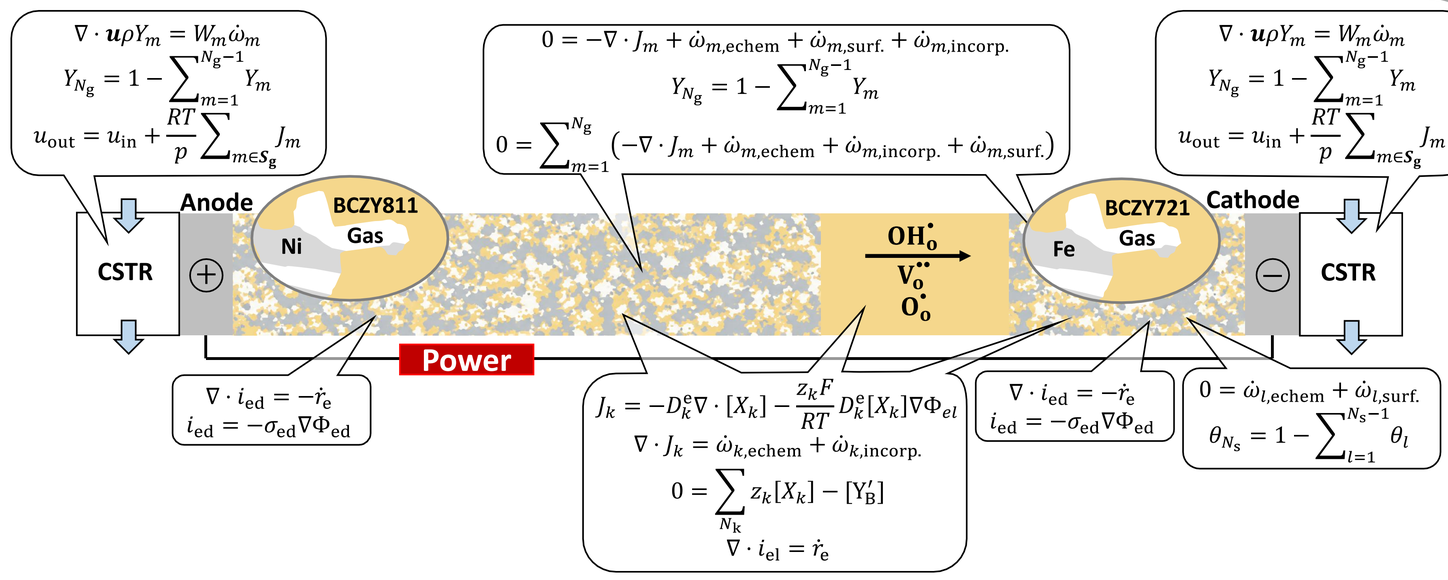
Electrochemical NH_3 Synthesis in Protonic Ceramic Cells

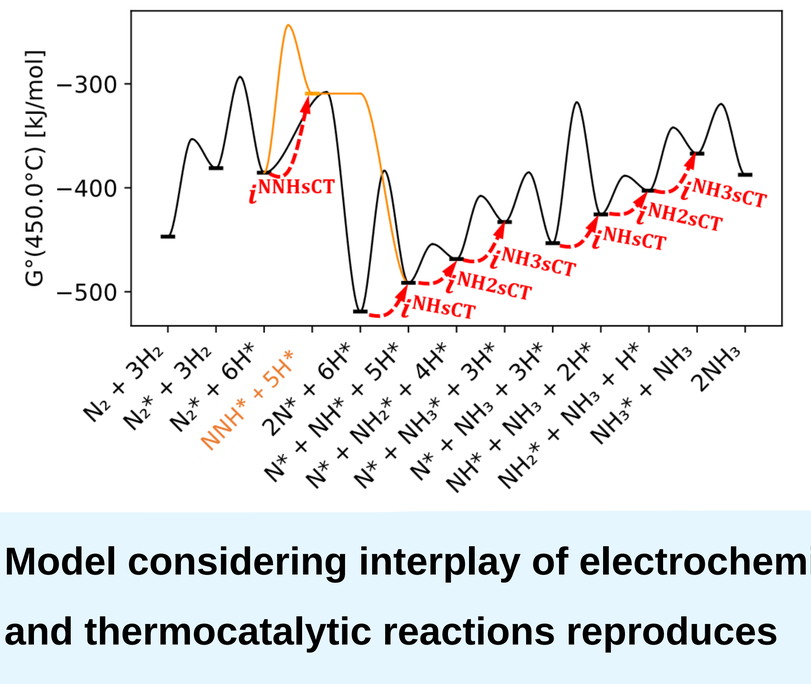
F. Ehrlich[1], O. Furst[1], P. Blanck[1], H. Zhu[2], R. J. Kee[2], O. Deutschmann[1]



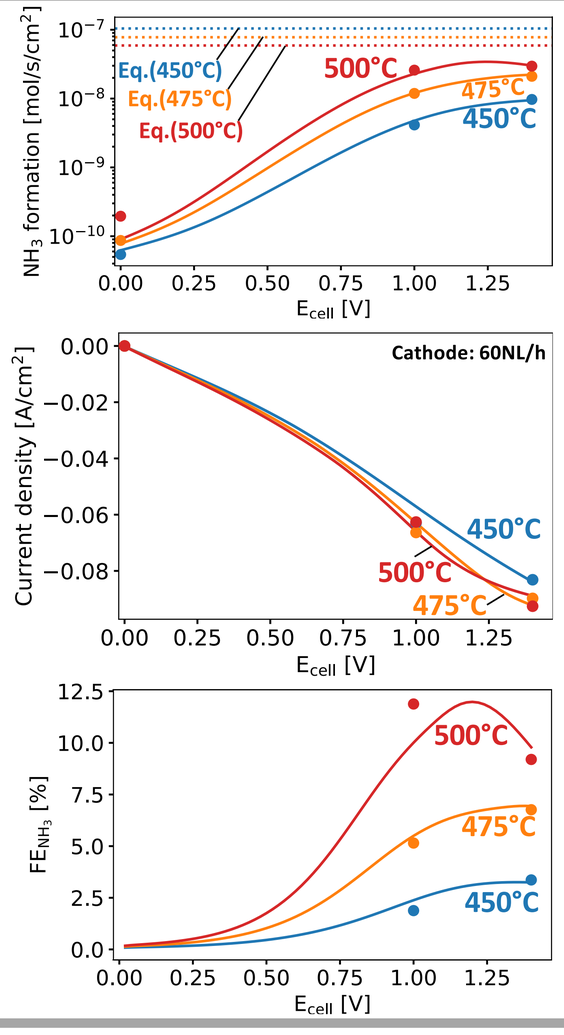
- **NH_3 production in cathode of protonic ceramic cell supplied with H_2 and N_2 [1]**
- **Microkinetic thermocatalytic and electrochemical reaction model**
- **Interplay with ceramic defect chemistry considered**

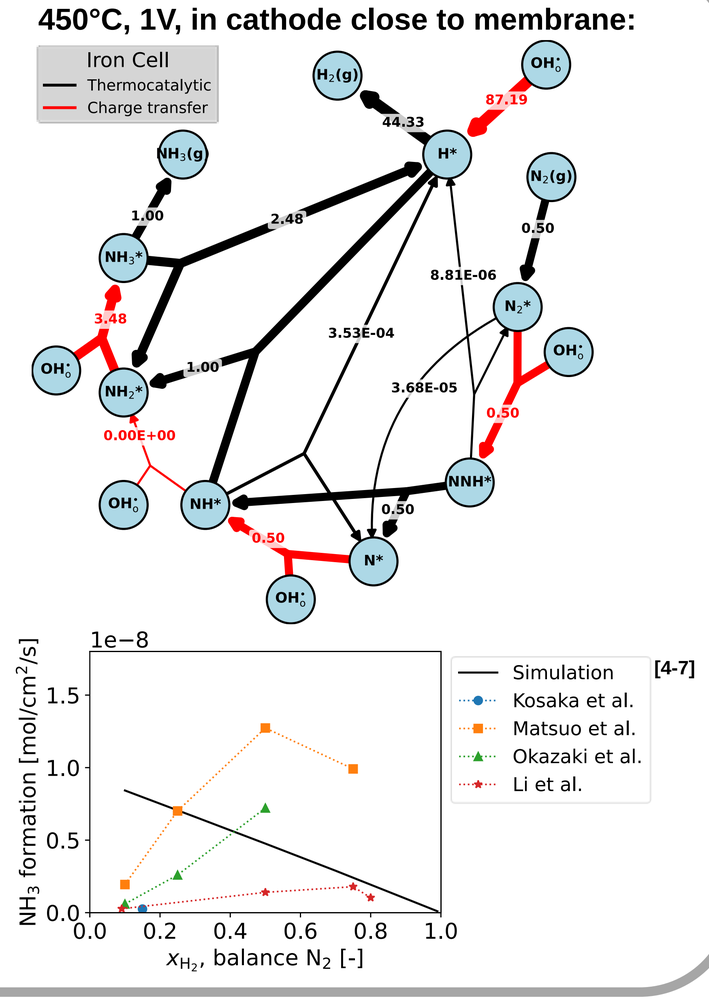
- **1-Dimensonal button cell model for:**
  - **Defect concentration profiles**
  - **Electrostatic potentials in ceramic and metal phase**
  - **Gas compositions, flow velocity and pressures[2]**
  - **Fe-catalyst surface coverages in cathode**





- **Model considering interplay of electrochemical and thermocatalytic reactions reproduces increase in NH_3 formation rate in cathode with increasing cell polarization[3]**
- **Dependence on H_2/N_2-ratio in feed not predicted succesfully, hinting at relevance of EPOC for NH_3 production.**





References:

1. Blanck et al., *J. Electrochem. Soc.*, **2025**, 172, 084507
2. Furst et al., *J. Electrochem. Soc.*, **2025**, 172, 074508
3. Blanck et al., Cell Reports Phys. Science, **2026**; 7
4. Kosaka et al., *ACS Sustainable Chem. Eng.*, **2017**, 5, 11, 10439
5. Matsuo et al., *Sustainable Energy Fuels*, **2021**, 5, 1, 188
6. Okazaki et al., *Ind. Eng. Chem. Res.*, **2024**, 63, 40, 17413
7. Li et al., *Int. J. Hydrogen Energy*, **2024**, 68, 1302

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