

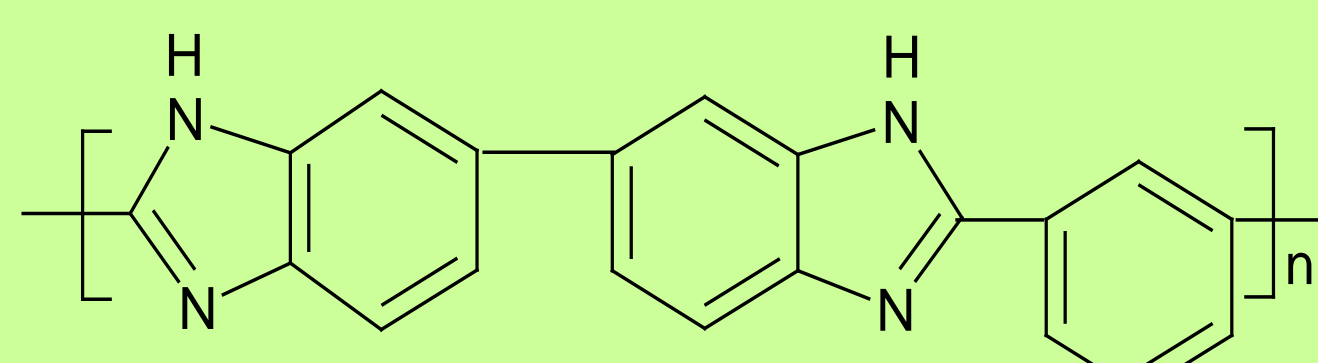
HIGH TEMPERATURE POLYMER FUEL CELLS AND THEIR INTERPLAY WITH FUEL PROCESSING SYSTEMS

JENS OLUF JENSEN, QINGFENG LI, RONGHUAN HE, GANG XIAO, JI-AN GAO and NIELS J. BJERRUM.

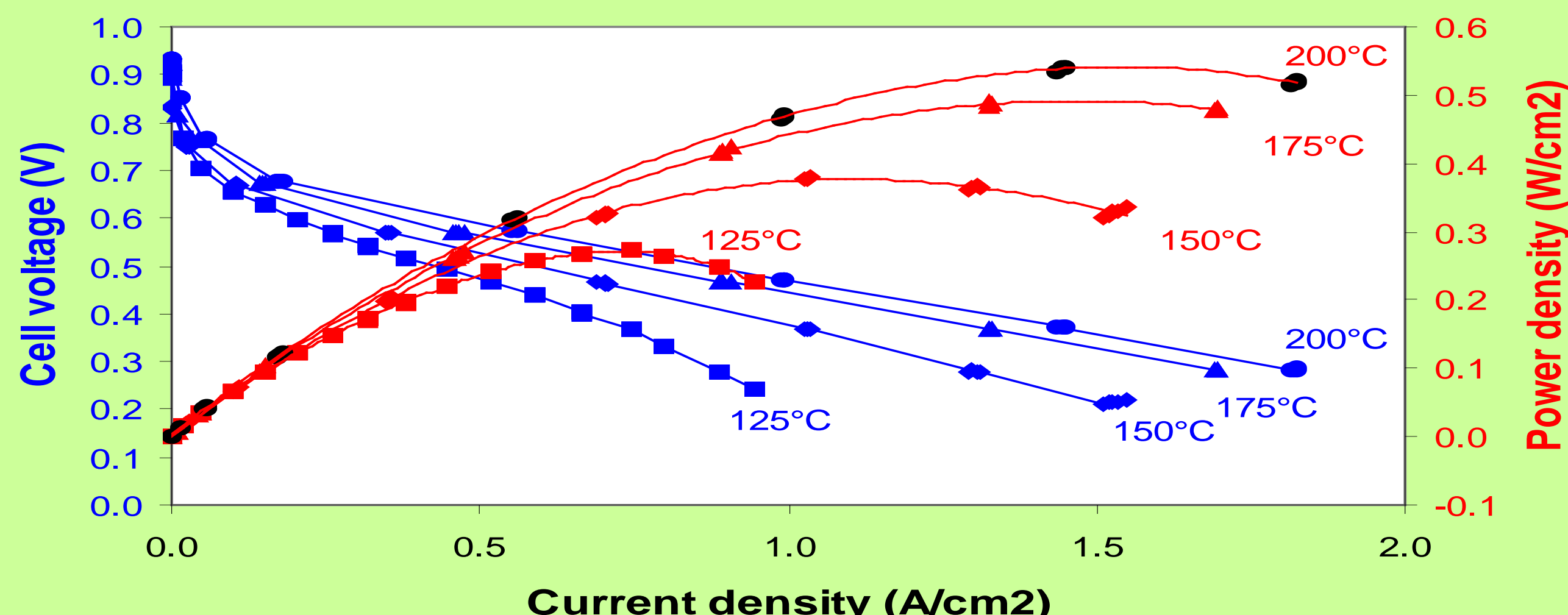
Department of Chemistry – Technical University of Denmark
Kemitorvet, building 207 – DK-2800 Lyngby – Denmark – joj@kemi.dtu.dk

Abstract

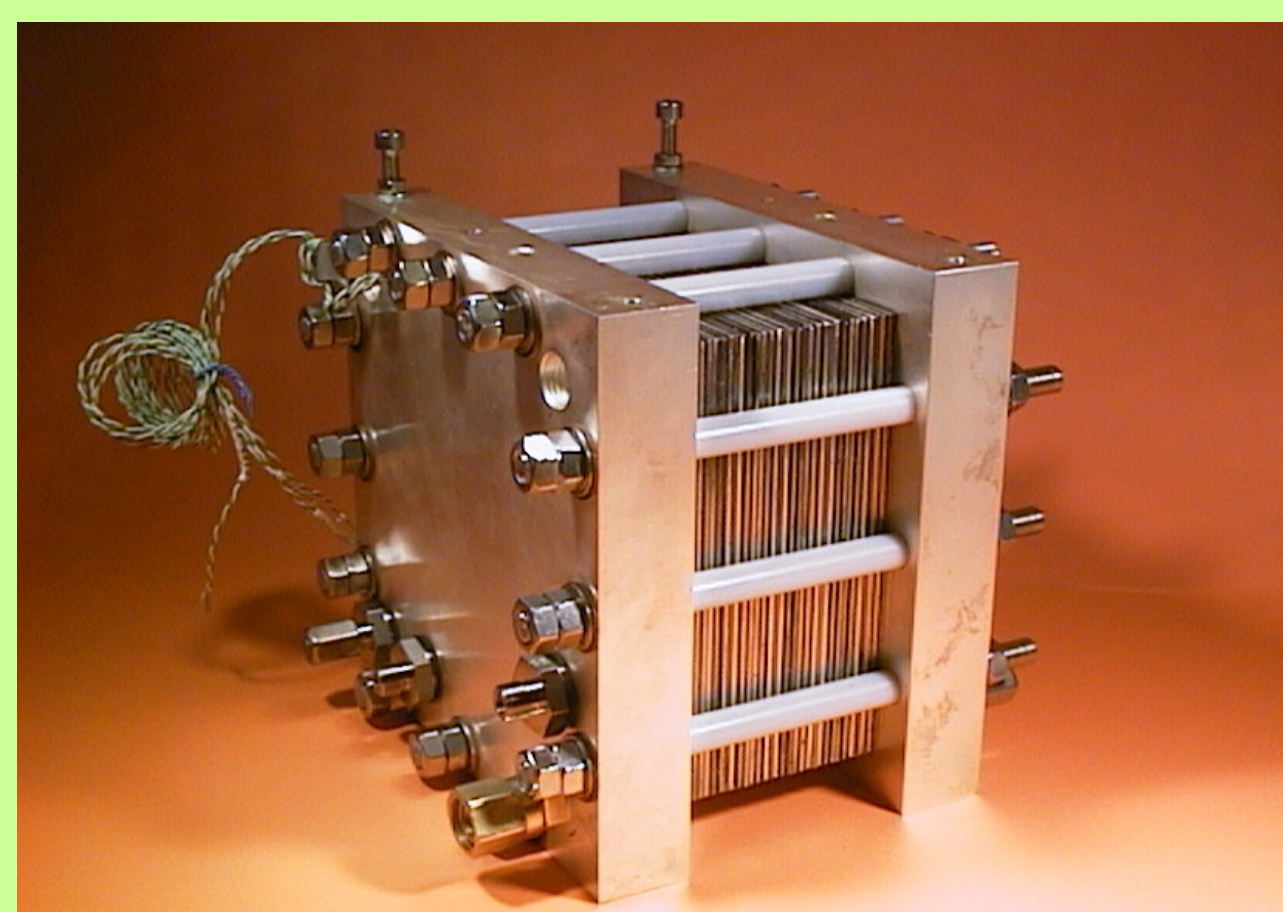
The present overview covers recent results from the department on high temperature polymer fuel cells (HT-PEMFC) based on the temperature resistant polymer polybenzimidazole (PBI) which allow working temperatures up to 200°C. The membrane has a water drag number near zero and need no water management at all. The high working temperature allows for utilization of the excess heat for fuel processing. Moreover, it provides an excellent CO tolerance of several percent, and the system needs no purification of hydrogen from a reformer. Continuous service for over 6 months has been demonstrated.



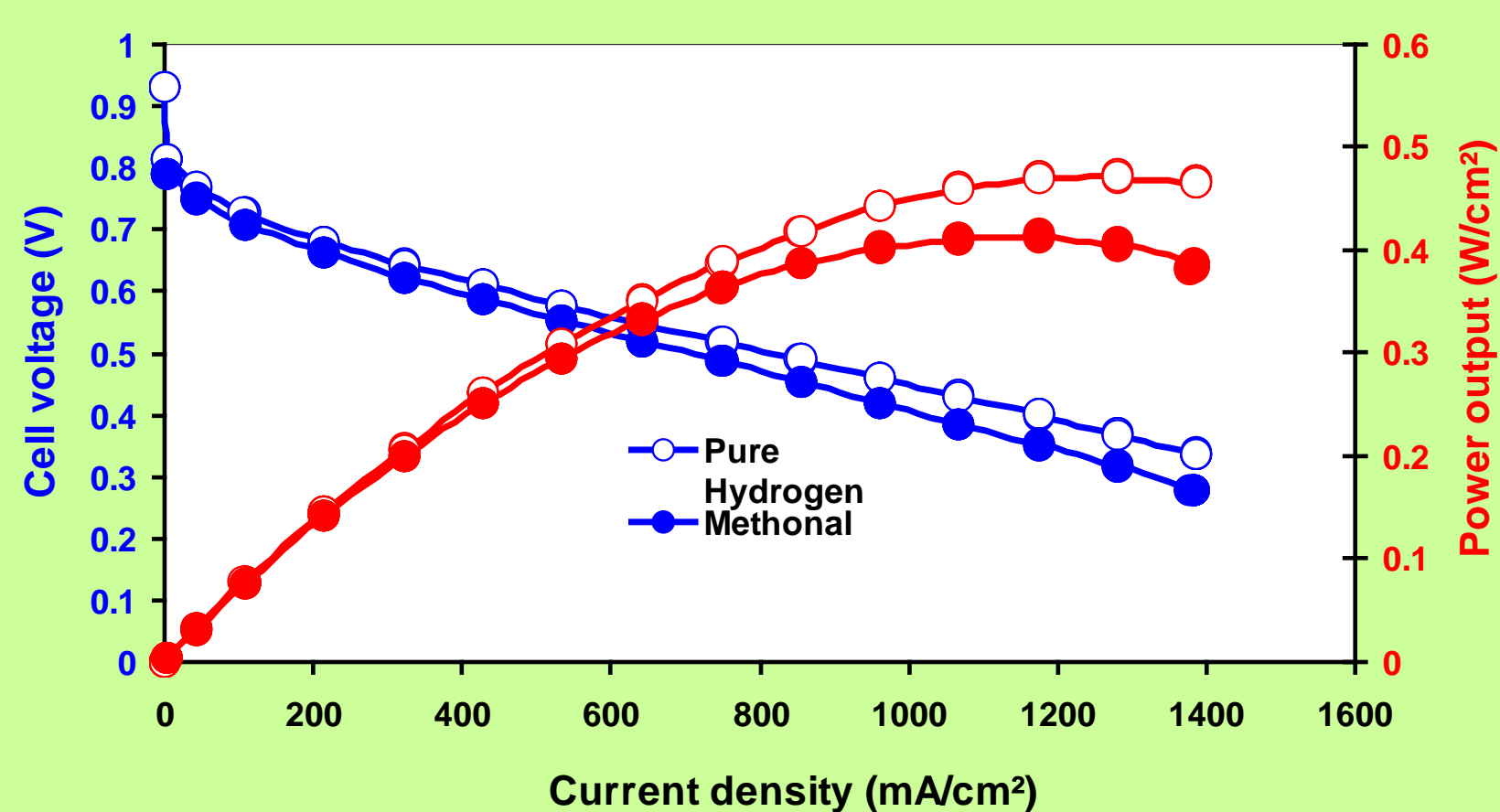
The repeating unit of PBI



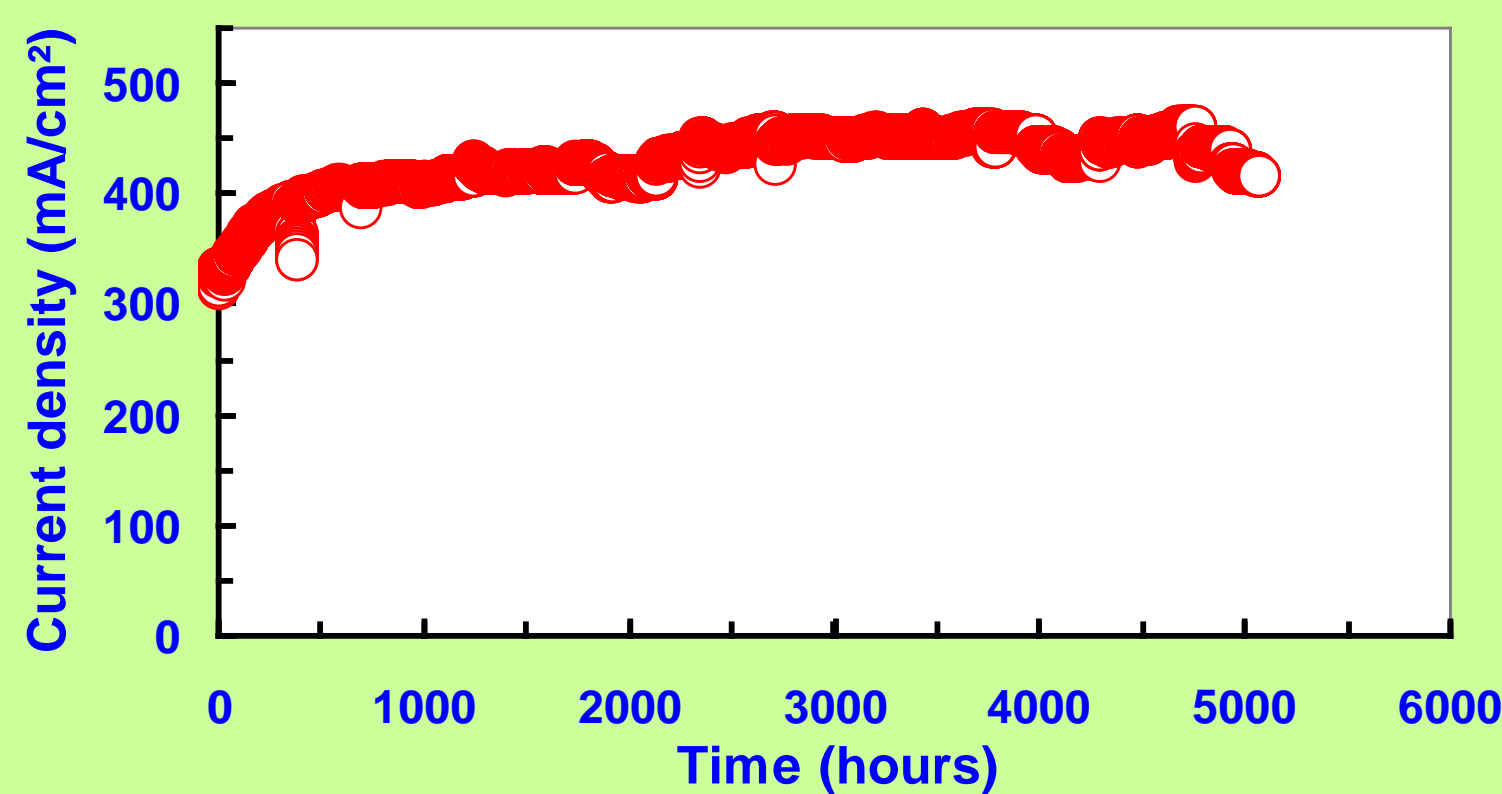
Polarization curves for single cell



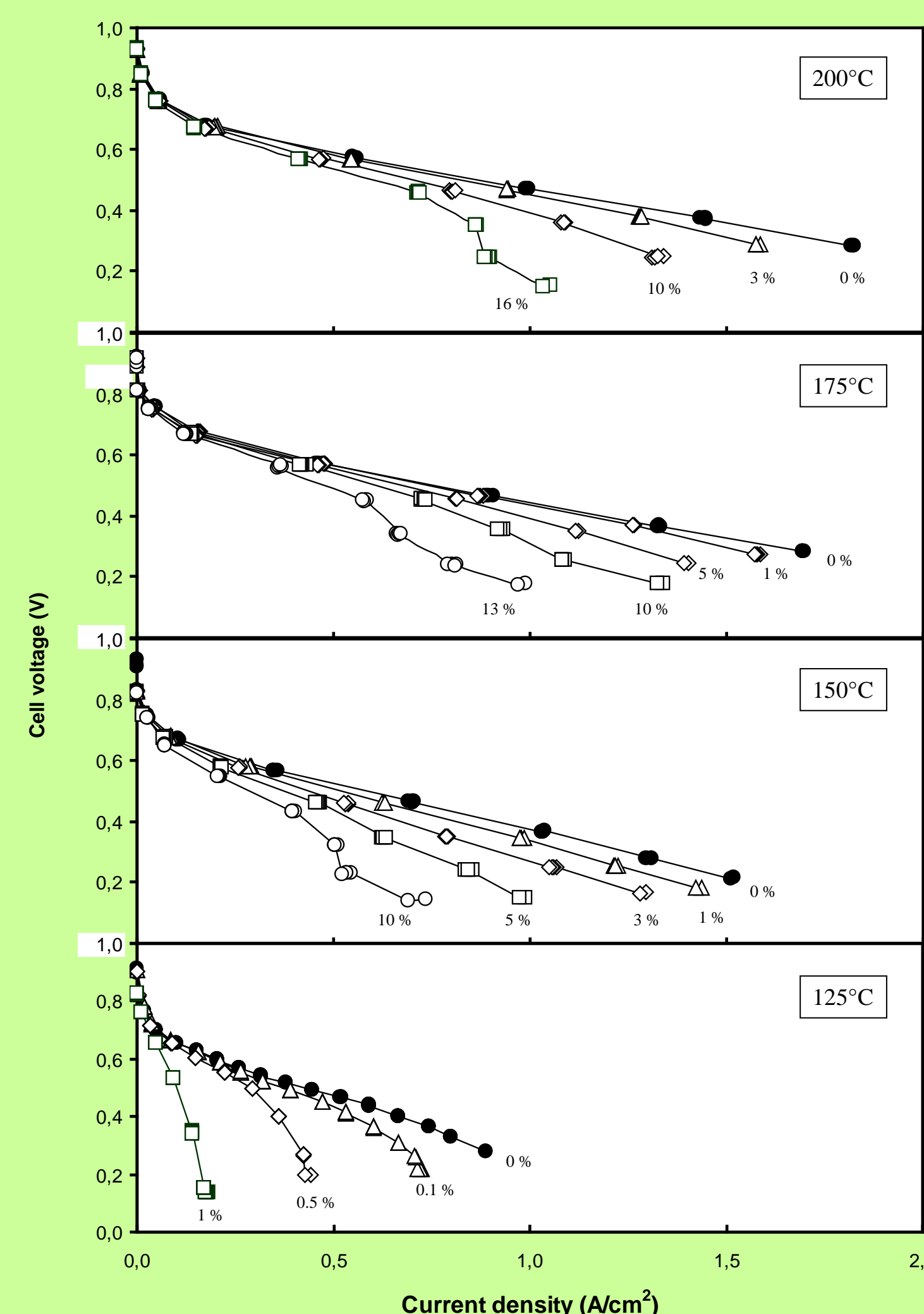
Stacks are under development



Polarization curves for a single cell and a methanol reformer both at 200°C

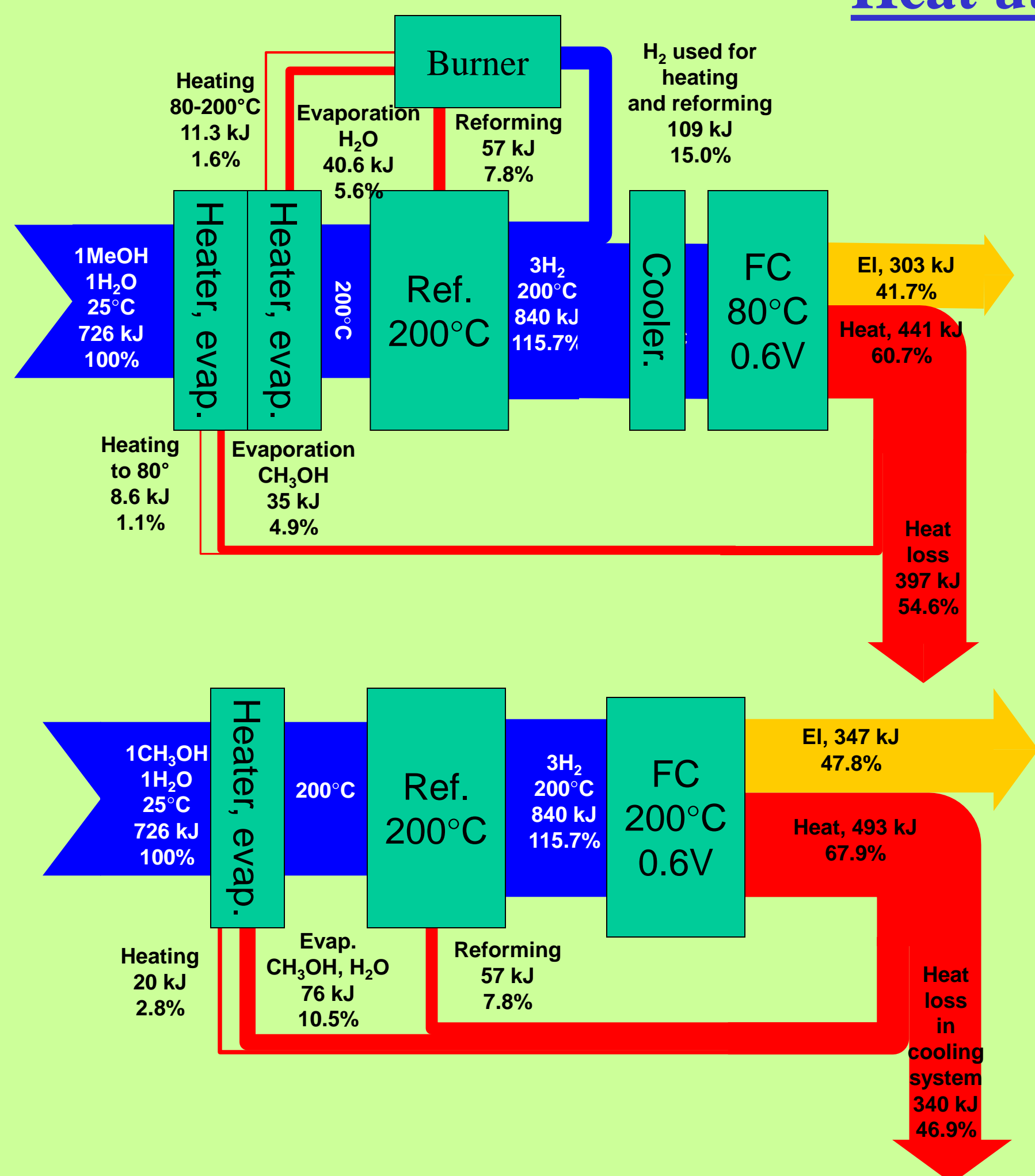


Lifetime for single cell at 150°C and 0.5V



Excellent CO tolerance

Heat utilization in systems with the fuel cell at 80 and 200°C



Left: A system with a 200°C methanol reformer (CO purification unit for 80°C not shown)

Right: A system with an NaAlH₄ hydrogen storage tank at 200°C (also possible at 110-150°C)

(The heat calculation is simplified)

Acknowledgement

The authors wish to thank the following for the financial support of the present work: the Nordic Energy Research Programme, the Nordic Industrial Fond, Danish Technical Research Council, Danish Power Systems ApS, the European Commission in the framework of the Non Nuclear Energy Programme JOULE III and the 5th Framework Programme.