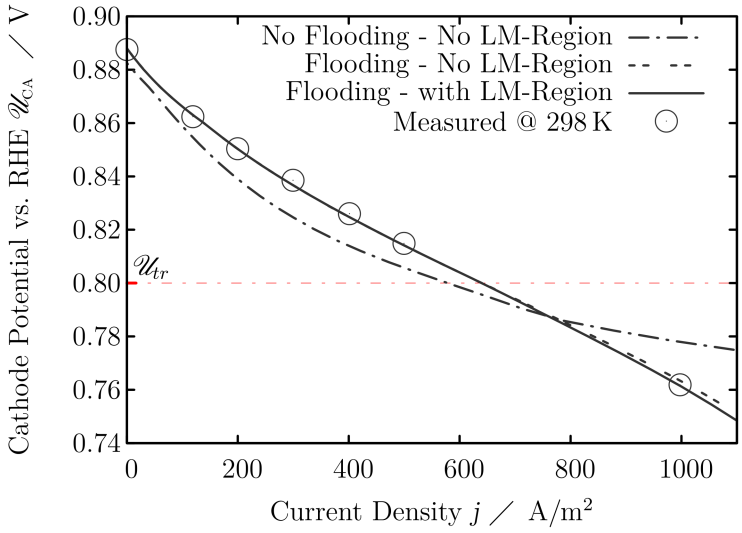

Fig. 4.4: Cathode at reference temperature 298 K. Comparison of published data [132] against the simulation with three different approaches. The difference between the graph with and without Langmuir-Region is small.

domain is expected, but it is with 10% smaller than the expected 45±5% [88]. The value of the fitted $\alpha_{lm} = 0.66$ at 333 K corresponds to data in literature, it is only 5 % under the value published by PARTHASARATHY [88][1].

4.3.2 Electrode and Cell Polarization at Varied Temperatures

The OCP of the cathode in fig. 4.6 is decreasing with temperature because of increasing methanol diffusion through the membrane, due to the rise of the temperature dependent diffusion transport of methanol across the membrane. But this trend changes at higher current densities. Fig. 4.5 demonstrates, that the methanol oxidation on the anode raises with temperature and increasing polarization. This causes a decline of methanol concentration at the membrane surface, hence, the crossover flow thins down. The diamond symbol ◇ in fig. 4.6 lies on the crossing point of the 298 and 333 K curves.

The polarization curves of the full cell in fig. 4.7 show the expected increase of the current density at a given fuel cell voltage with rising temperature. But the increase of current density slows down with growing temperature, this is caused by the opposite trend of the cathode polarization, as is visible in fig. 4.6.

[1] $\alpha_{lm} = 0.66 \mathrel{\widehat{=}}$ -0.112 V/decade Δj_{OR}, cf. eq. 2.22 on page 32