Dr. Cremers studied Chemistry at the University of Düsseldorf where he graduated in Physical Chemistry in 1995 and received his PhD in 1998. From 1998 to 2000 he became PostDoc at the French CNRS Laboratory LURE in Orsay France, where he worked on photo resist and etching procedures for Deep Etch X-Ray Lithography for MEMS application. He started working on fuel cells topics in 2000 when he joined the Group of Prof Ulrich Stimming at the Technical University of Munich (TUM), Germany where he first lead a project on micro-structured inline reformers for PEMFC applications before starting to work on DMFC catalyst. He stayed in Munich from 2000 – 2006 working at the TUM and the Bavarian Center for Applied Energy Research as group leader fuel cells. In 2006 he joined Fraunhofer ICT where he became group leader of the fuel cell team in 2010.

“Polymer electrolyte membrane fuel cells not working on pure hydrogen”

For many interesting applications for fuel cells the use of pure hydrogen as fuel is at least today not desirable as the volumetric energy density is to low and/or the logistic burden created by the hydrogen supply is too high. In these cases the use of a liquid fuel with a high energy density would be preferred. The direct conversion of fuel such as alcohols has further the advantage of leading to rather simple and thus robust system designs, which renders them very suitable for applications like portable power supply or back-up power. Other fuels like petrol or diesel will however need to be reformed before use in any fuel cell available today.

The conversion of reformates as well as of most alcohols in high temperature type fuel cells like SOFC is technically less challenging. However, these types of fuel cell are less suitable for applications which require regular start-stop cycling because of issues like prolonged start-up time and high energy expenditure for heating up. Fraunhofer ICT is investigating fuel cell catalysts for two innovative polymer electrolyte membrane based fuel cell types for these application. On the one hand we are investigating catalyst for direct alcohol fuel cells based on alkaline anion exchange membrane technology for the conversion of methanol and ethylene glycol. Here we are working on Pd alloy catalyst for the anodic alcohol oxidation which can accomplish up to 900 mA/mg mass activity at ambient temperature for the ethylene glycol oxidation. In addition, we work on catalysts for HT-PEMFC operated with reformate containing sulphur impurities. Here catalyst with H₂S tolerance up to 20 ppm and H₂S oxidation activities in 40% H₂S gas streams were developed. In the discussion the different type of fuel cells will be introduced and some of the accomplishments made at the Fraunhofer ICT will be discussed.