

EXCITONS IN HIGHLY EFFICIENT ORGANIC DEVICES



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Abstract: Organic semiconductors with conjugated electron system are currently intensively investigated for optoelectronic applications. This interest is spurred by novel devices such as organic light-emitting diodes (OLED), and organic solar cells. For both devices, high efficiency is a key parameter for many applications. In this talk, I will discuss some of the recent progress on highly efficient OLED and solar cells. In both classes of devices, excitons play crucial roles: in OLED, efficient radiative recombination is key, in solar cells, exciton separation is the key process. Specifically, I will briefly discuss results on white OLED where triplet harvesting allows to achieve high quantum efficiencies despite using fluorescent blue emitters. Even richer are the exciton phenomena in organic solar cells. I will discuss results of exciton separation dependence on energetic alignment and the influence of triplet generation in bulk heterojunction devices.

Bio Karl Leo obtained the Diplomphysiker degree from the University of Freiburg in 1985, working with Adolf Goetzberger at the Fraunhofer-Institut für Solare Energiesysteme. In 1988, he obtained the PhD degree from the University of Stuttgart for a PhD thesis performed at the Max-Planck-Institut für Festkörperforschung in Stuttgart under supervision of Hans Queisser. From 1989 to 1991, he was postdoc at AT&T Bell Laboratories in Holmdel, NJ, U.S.A. From 1991 to 1993, he was with the Rheinisch-Westfälische Technische Hochschule (RWTH) in Aachen, Germany. He became Full Professor of Optoelectronics at the Technische Universität Dresden in 1993. Since 2002, he has worked at the Fraunhofer-Institution for Organics, Materials and Electronic Devices COMEDD and currently serves as director. His main interests are novel semiconductor systems like semiconducting organic thin films; with special emphasis to understand basics device principles and the optical response. His work was recognized by the following awards: Otto-Hahn-Medaille (1989), Bennigsen-Förder-Preis (1991), Leibniz-Award (2002), award of the Berlin-Brandenburg Academy (2002), Manfred-von-Ardenne-Preis (2006), and Zukunftspreis of the German president (2011). He is cofounder of several companies, including Novalad AG and Heliatek GmbH.