
HL 1: Invited Talk Kümmell

Time: Monday 9:30–10:15

Location: ER 270

Invited Talk

HL 1.1 Mon 9:30 ER 270

Electrically driven single quantum dot emitter operating at room temperature — •TILMAR KÜMMELL¹, ROBERT ARIANS¹, GERD BACHER¹, ARNE GUST², CARSTEN KRUSE², and DETLEF HOMMEL² —¹Werkstoffe der Elektrotechnik, Universität Duisburg-Essen, Duisburg — ²Institut für Festkörperphysik, Universität Bremen, Bremen

Single self-organized semiconductor quantum dots are regarded as one of the most interesting approaches for realizing single photon sources. Although several device concepts have been presented, their applicability was limited to low temperatures up to now. Here, we present electrically driven emission from one single quantum dot at room temperature.

The single quantum dot emitter is based on epitaxially grown CdSe/ZnSSe quantum dots. By sandwiching the active area between MgS barriers, access to room temperature photoluminescence from a single quantum dot became possible [1]. Choosing an appropriate thickness, the MgS barriers do not hamper an electrically driven operation. Embedding the quantum dot active layer into a p-i-n diode, we succeeded in obtaining room temperature electroluminescence from one single quantum dot at a voltage of $U = 2.6$ V. We observe no significant loss of quantum efficiency with respect to 4 K. The emission linewidth at $T = 300$ K is about 25 meV and is thus not exceeding the biexciton binding energy, a crucial point for an operation as a single photon emitter.

[1] R. Arians et. al, Appl. Phys. Lett. 90, 101114 (2007)