Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Time-resolved photoluminescence of SiOx encapsulated Si[1]
SEREF KALEM, Tubitak-Bilgem, AMAL HANNAS, TOMAS STERMAN, VILLY SUNDSTRM, Lund Laser Center, University of Lund, Sweden — Silicon and its oxide SiOx offer a number of exciting electrical and optical properties originating from defects and size reduction enabling engineering new electronic devices including resistive switching memories. Here we present the results of photoluminescence dynamics relevant to defects and quantum confinement effects. Time-resolved luminescence at room temperature exhibits an ultrafast decay component of less than 10 ps at around 480 nm and a slower component of around 60 ps as measured by streak camera. Red shift at the initial stages of the blue luminescence decay confirms the presence of a charge transfer to long lived states. Time-correlated single photon counting measurements revealed a life-time of about 5 ns for these states. The same quantum structures emit in near infrared close to optical communication wavelengths. Nature of the emission is described and modeling is provided for the luminescence dynamics. The electrical characteristics of metal-oxide-semiconductor devices were correlated with the optical and vibrational measurement results in order to have better insight into the switching mechanisms in such resistive devices as possible next generation RAM memory elements.

[1]"This work was supported by ENIAC Joint Undertaking and Laser-Lab Europe"

Seref Kalem
Tubitak-Bilgem

Date submitted: 04 Feb 2016 Electronic form version 1.4