**Electronic properties of silicon nanocrystals for memory applications**

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The use of silicon nanocrystals has been proposed by several groups in order to develop highly integrated few-electron memories. In spite of the fact that nonvolatile memories with Si nanocrystals have been demonstrated, it remains necessary to determine the electronic properties of silicon nano-floating gates in order to perform reliable device modeling. Basic data, such as the relevant bandgap or electronic state structure, are still not well known, as the fabrication processes are not highly reproducible. Furthermore, depending on the fabrication method, the nanocrystals may contain extrinsic defects that can act as trapping centers. A full understanding of the nanocrystal properties and quality is therefore a critical step for the development of quantum device models which include Coulomb blocade phenomena and extrinsic defects.

Our study is focused on the comparison of the electronic properties of Si nanocrystals obtained by direct LPCVD deposition or by thermal annealing of $SiO_x$. We will present morphological characterizations by HR-TEM. Bandgap determination by optical methods will show that it is possible to have a certain size control of these nanocrystals. Finally, the write/erase kinetics and the retention time in Si nanocrystal devices will be discussed for both material systems. For that purpose, I-V, C-V and C-t experiments have been performed at various temperatures on MOS capacitors and transistors containing Si nanocrystals.