Gossamer

Project 214431

Gigascale Oriented Solid State flAsh Memory for EuRope

Industrial partners:
NUMONYX (NUMONYX), Italy
Qimonda (QmD), Germany
ASM Europe BV (ASMI), Belgium
Active Technologies (AT), Italy
Jordan Valley (JV)
Management consulting
Alma Consulting Group (ALMA), France

Research partners
IMEC (IMEC), Belgium
CNR (CNR), Italy
Tyndall Research Centre (Tyndall), Ireland
IUNET (IUNET), Italy
University of Freiberg (TUBAF), Germany
Fraunhofer CNT (Fraun), Germany
University of Braunschweig, Germany

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An Integrated Project under FP7

Objectives:

To develop the Charge Trapping Technology for very high density Non Volatile Memories for mass storage, targeting the 22 nm technology node.

Start date; Jaury 1st, 2008

Duration: 3 years

Memory for the mobile World

During the last 15 years, ICTs have provided a number of radically new devices / techno-toys that have improved the daily life of the EU citizen: mobile phone, digital camera, MP3 players, PC, PDA, credit cards, video on discs, flat screen, HD TV, fast communications (ADSL)....

The need of more and more "memory" is shared by all applications of ICTs such as enhancing life comfort and security, leisure, education, business and improving work productivity.

At the moment there seems to be no sign for a slowing down of memory requirements: in spite of the doubling of memory density every 18 months, the diffusion of broadband communication and digital appliances, and the constant demand for better quality of images and sound, is creating an ever increasing need for large memories in a variety of new media.

Solid-state memories are the preferred solution for mobile applications. Their main advantages are the use of consolidated technology, the lack of any mechanical parts, which results in stronger ruggedness, lighter weight, smaller form-factor, better reliability and, above all, **lower power dissipation**.

And solid-state mass-storage today means NAND Flash memories

What are Flash?

Flash memory is non-volatile computer memory that can be electrically erased and reprogrammed. It is a technology that is primarily used in memory cards and USB flash drives general storage and transfer of data between computers and other digital products. Flash memory is non-volatile, which means that no power is needed to maintain the information stor in the chip.. (Wikipedia)

Pushing the limits of Flash

NAND Flash is by far the dominant technology for solid-state mass-storage. However, the floating gate concept is predicted to face technological limits around the 32nm node. The main physical limits that prevent further scaling of the cells are:
-cell to cell interference, due to the parasitic capacitive coupling among neighbouring floating gates;
-low coupling ratio with the control gate, which results also in a small stored charge.

year	2004	2006	2008	2011	2014
Node	90nm	65nm	45nm	32nm	22nm
NOR					
NAND					

On the other side, trap-related leakage currents in the dielectrics prevent any scaling of the cell dielectrics, which could relieve this issue. Further reduction of cell size will increase the requirements for error correction beyond the feasibility limits.

The most promising option to overcome these scaling limitations, while retaining the very high integration density of NAND Flash architecture seems to be the replacement of the conventional floating gate with a charge trapping layer.

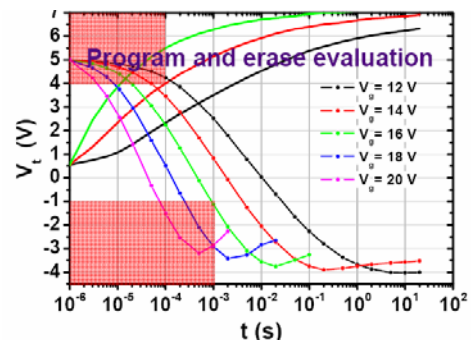| Metal gate	Tantalum
High-k	Alumina
SiN	Nitride
SiO2	Oxide
Si subs	Silicon
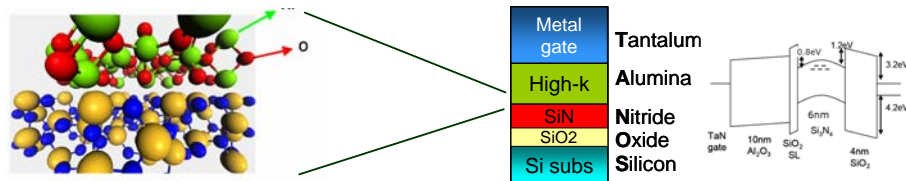
Project Approach
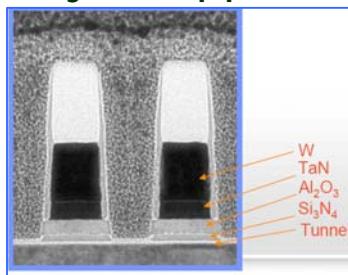
The consortium is build around two major European semiconductor companies, Numonyx and Qimonda, with a strong experience and a technical leadership in different types of memories (DRAM for Qimonda and NOR Flash for Numonyx) and have a great interest for NAND Flash memories, because of their strategic importance for a variety of applications.
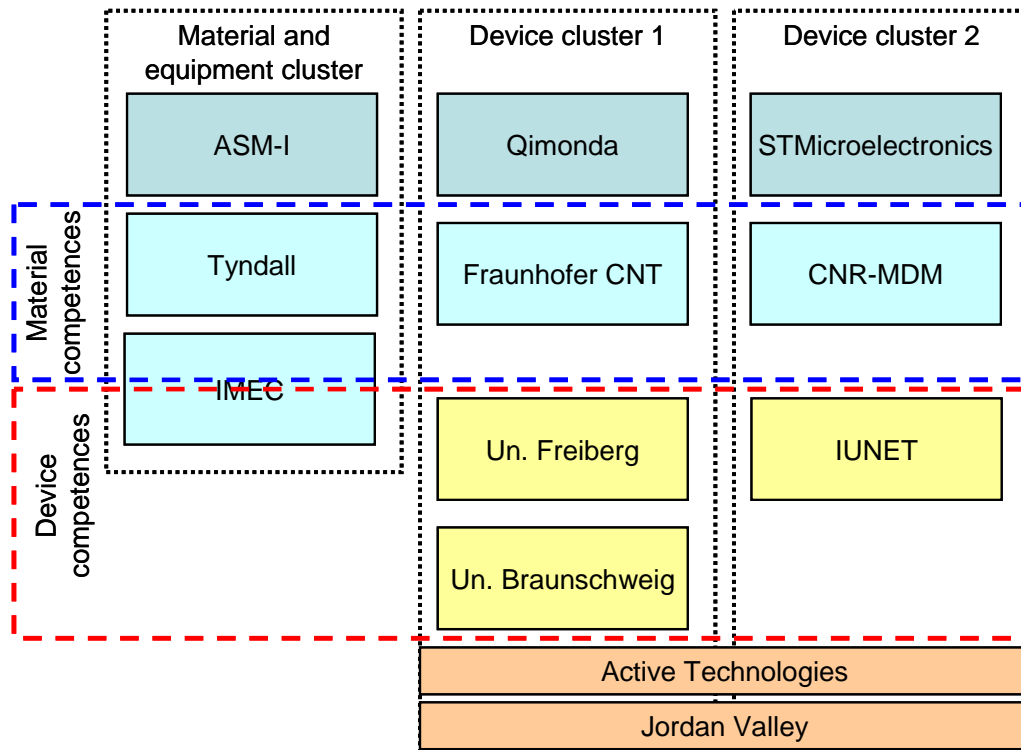The consortium includes a balanced combination of all types of research performers: Large Industry, Small and Medium Industry, Research Centres and Universities

The key to the success of the project will be in the tight integration of allocated resources and their focalization, inside 7 Work Packages:

  WP0 Management
  WP1 Material Development
  WP2 Cell Architecture
  WP3 Process Integration
  WP4 Demonstrator
  WP5 Characterization & Reliability
  WP6 Higher density Architectures
  WP7 Dissemination & Training

GOSSAMER Consortium

Material and equipment cluster	Device cluster 1	Device cluster 2
ASM-I	Qimonda	STMicroelectronics
Tyndall	Fraunhofer CNT	CNR-MDM
IMEC		
	Un. Freiberg	IUNET
	Un. Braunschweig	

Material competences

Device competences

Active Technologies
Jordan Valley

(Company Logos inside)

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