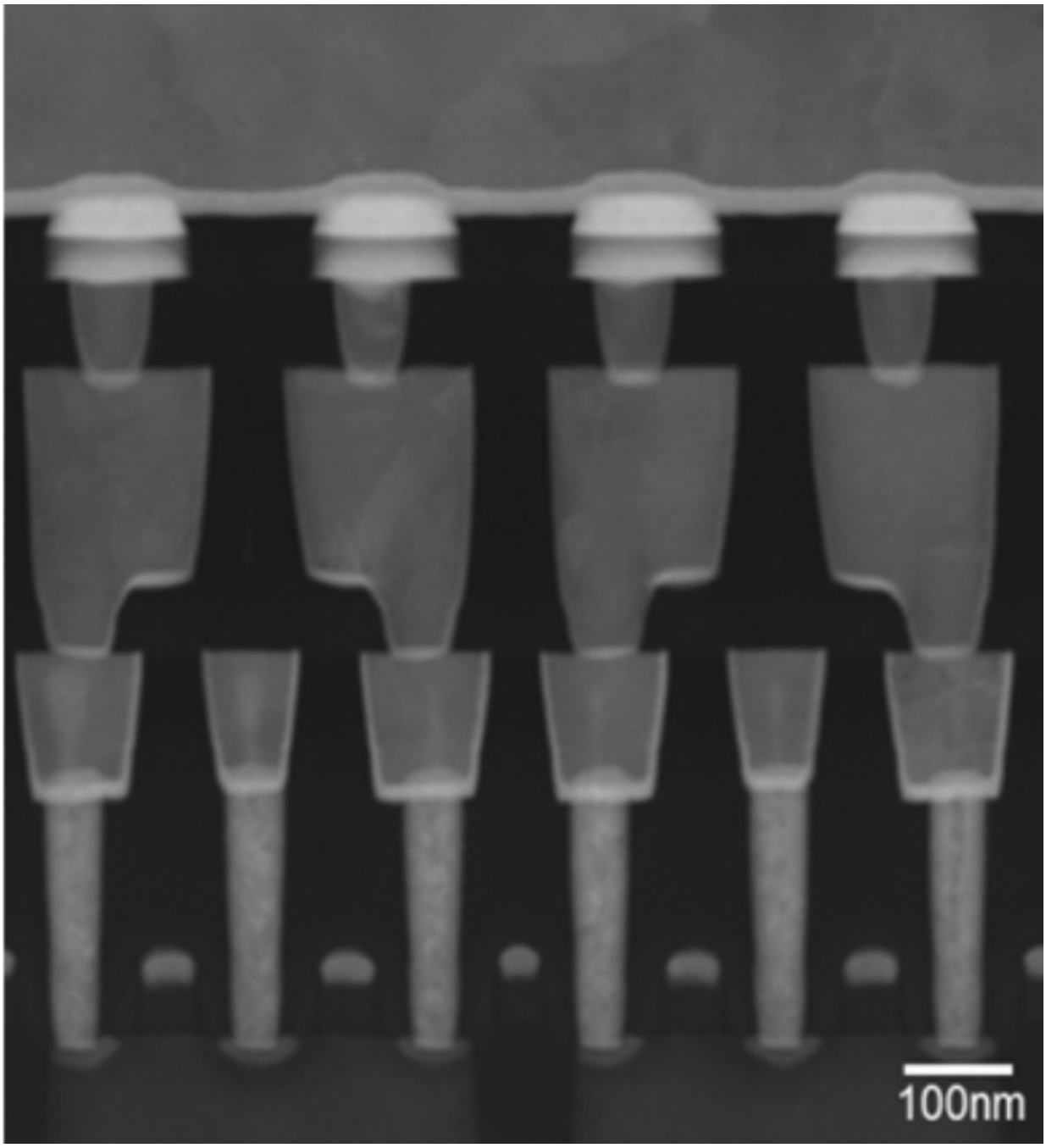
Imec and Panasonic demonstrate breakthrough RRAM cell

July 14 2015, by Hanne Degans



Cross-sectional TEM of 40-nm Ir(TE)/Ta2O5/TaOx/TaN (BE) RRAM

Imec and Panasonic Corp. announced today that they have fabricated a 40nm TaOx-based RRAM (resistive RAM) technology with precise

filament positioning and high thermal stability. This breakthrough result paves the way to realizing 28nm embedded applications. The results were presented at this year's VLSI technology symposium (Kyoto, June 15-19 2015).

One of today's most promising concepts for scaled memory is RRAM which is based on the electronic (current-or voltage-induced) switching of a resistor element material between two metals. Imec and Panasonic developed a method that overcomes filament instability in RRAM, one of the critical parameters that impacts the memory state during read operation in resistive memory.

The method was realized using a combination of process technologies such as low-damage etching, cell side oxidation, and an innovative encapsulated cell structure with an Ir/Ta2O5/TaOx/TaN stacked film structure featuring a filament at the cell center. With these methods, a 2-Mbit 40nm TaOx-based RRAM cell with precise filament positioning and high thermal stability was achieved. The memory array showed excellent reliability of 100k cycles and 10 years' retention at 85°C. Additionally, the filament control and thermal stability technologies offer the potential to realize 28nm cell sizes.

Gosia Jurczak, director of imec's research program on RRAM devices stated: "With these breakthrough results, we have proven the potential of this promising memory concept as embedded nonvolatile memory in 28nm technology node where conventional NOR Flash shows scaling limitations. This result is a confirmation of our leadership position in research and development on resistive memory."

Provided by IMEC