

## The electrical properties of NVM with Si nanocluster formed by a pulse-type gas feeding technique in the LPCVD system

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The Si nanocluster nonvolatile memory has been widely studied because it is predicted to provide high performance features fast high program/erasing speed, long retention time, superior endurance and the further miniaturization of the conventional flash memory. [1]

In this work, we deposited Si nanocluster floating gate using a digital gas-feeding method in the low pressure chemical vapor deposition to obtain Si nanoclusters with a uniform size and high density. The maximum density and average size of Si nanoclusters were obtained to be  $7 \times 10^{11}/\text{cm}^2$  and 7 nm, respectively. [2] To verify that this method is available to Si nanocluster nonvolatile memory application, we fabricated the memory device containing Si nanoclusters, which is formed through the pulse-type gas feeding method. It was found that the threshold voltage shift was 4.5 V upon applying the gate voltage at +18/-18 V. In the nonvolatile memory operations, the program and erasing times of Si nanocluster floating gate memory were 1  $\mu\text{s}$  and 50 ms, respectively, and the retention time was estimated to be about 10 years.

### [References]

- [1] Jan De Blauwe, IEEE Transactions on nanotechnology, Vol. 1, No. 1, March 2002.
- [2] Chan Park, Kyoungmin Kim, Eunkyeom Kim, Junghyun Sok, Kyoungwan Park, Moon-sup Han, Materials science and engineering B, Volume 140, Issues 1-2, 25 May 2007, Pages 103-108