METALLOPORPHYRINS FOR MEMORY APPLICATIONS

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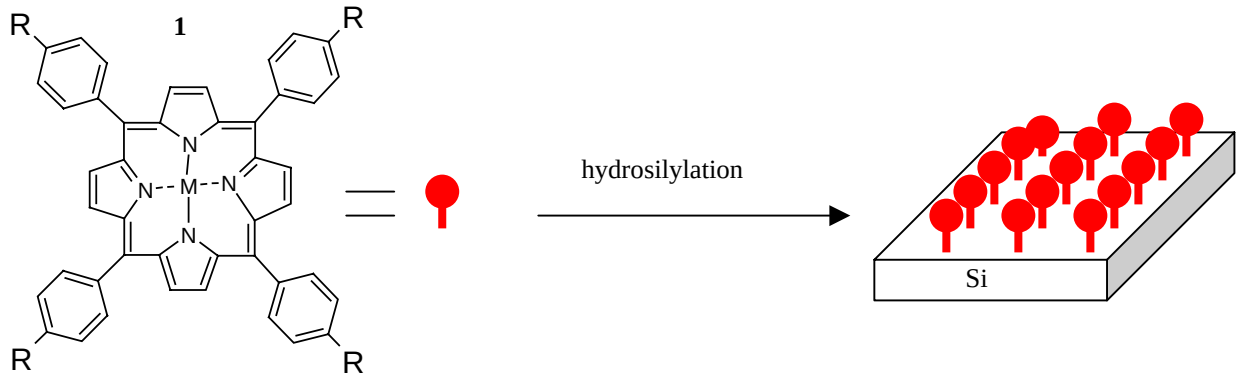
In the field of microelectronics miniaturization of components is a very important issue. However it seems that the industrial processes used for miniaturising electronic devices will soon reach their limits. By 2015 memory devices are meant to display very long retention time and low voltage consumption at the nanometre scale. These expectations are too high for the industrial processes used nowadays. Therefore a new type of memory has to be designed.

In the field of molecular electronics among other projects, it was suggested to fabricate a hybrid memory device made of porphyrins anchored on a transistor. The ability of these redox active molecules to reversibly convert from one to the other redox state is exploited to tune the different electrical states of the transistor. Some systems developed so far are comparable to electrochemical cells;[1,2] however recently a very promising hybrid CMOS / molecules system was produced.[3] At the CEA-Grenoble, we plan to immobilise metalloporphyrins on silicon instead of silica or gold which are the most commonly used surfaces in the fabrication of such devices. The porphyrins synthesised are functionalised with alkenes or alkynes end groups to enable the hydrosilylation reaction between the molecules and the silicon surface.

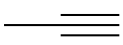
References:

[1] David F. Bocian et al., Science, 2003, 302, 1543-1545
[2] Lindsey et al., J. Org. Chem., 2000, 7379
[3] Misra et al., US Pat. No. 2003/0111670 A1

Figures:



M = Mn, Fe, Co, Ni

a. R = 

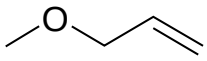
b. R = 

Figure 1: Schematic representation of porphyrins anchored on a silicon wafer