

## INTER AND INTRA MOLECULAR LEVEL LOGIC DEVICES

Françoise Remacle

Department of Chemistry, University of Liège, Belgium

We present concrete examples, up to the level of a full adder, of concatenated logic gates that are operated on different parts of a molecule or on different molecules that are coupled. The proposed scheme uses the (optical) excitation of molecular levels and their intramolecular and intermolecular dynamics to connect several logic gates. We will then show that it is possible to implement finite state machines such as a cyclable full adder optically at the molecular level on a three-level system. This work is part of the **MOLDYNLOGIC** FET-Open STREP project whose objectives are the implementation of combinational logic circuits and finite state computing machines on a single molecule or assemblies of molecules.

see <http://moldynlo.ulg.ac.be>

---

### Bibliography

---

1. Remacle, F.; Speiser, S.; Levine, R. D., Intermolecular and Intramolecular Logic Gates. *J. Phys. Chem. A* **2001**, 105, 5589-5591.
2. Remacle, F.; Levine, R. D., Towards Molecular Logic Machines. *J. Chem. Phys.* **2001**, 114, (23), 10239-10246.
3. Remacle, F.; Heath, J. R.; Levine, R. D., Electrical Addressing of Confined Quantum Systems for Quasiclassical Computation and Finite State Logic Machines. *Proc. Natl. Acad. Sci. USA* **2005**, 102, 5653-5658.
4. Remacle, F.; Weinkauff, R.; Levine, R. D., Molecule-Based Photonically-Switched Half and Full Adder. *J. Phys. Chem. A* **2006**, 110, (1), 177-184.
5. Remacle, F.; Levine, R. D., All Optical Digital Logic: Full Addition or Subtraction on a Three-State System. *Phys. Rev. A* **2006**, 73, 033820-7.
6. Remacle, F.; Levine, R. D., Towards Parallel Computing: Representation of a Linear Finite State Digital Logic Machine by a Molecular Relaxation Process. *Eur. Phys. J. D* **2006**, 1434-6060 -11.

