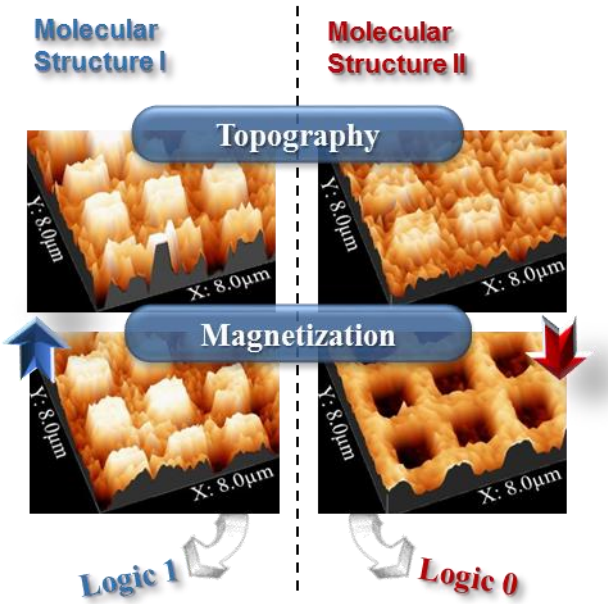
Supplemental Information – Oren Ben Dor

As global data accumulation increases at an ever-growing rate, amounting to more than 10% of worldly power consumption, further miniaturization and the decrease of power utilization have the highest priority in the development of our information and communication technologies. Memory technologies available today offer a variety of methods; all have advantages but also suffer from various drawbacks. Hence, memory performance is fast becoming the key bottleneck that limits system performance. Both industry and academia have been investing tremendous efforts trying to scale down current magnetic based memory technologies, while specifically targeting power consumption issues. Nonetheless, current methods require high currents for magnetization to occur, thus yielding high energy losses, and are also temperature sensitive.



Topography images of chiral molecules adsorbed in selective areas on ferromagnetic thin layers, and their corresponding molecular induced magnetic phase images.

However, recently, a chiral-based logic device concept was demonstrated at room temperature, without any external stimuli – no currents nor external magnetic fields. Here, chiral molecules were adsorbed in highly spatially localized selective areas (~50nm), on top of a thin ferromagnetic layer (~1.5nm). This innovative yet simple approach exposed a most intriguing phenomenon; magnetization was not only scaled down to single domain size, but also excellent binary logic was obtained with magnetization reorientation, merely by controlling the helical properties of the incorporated chiral molecules. Here, power consumption required for magnetization switching was reduced by 12 orders of magnitude at room temperature, compared to conventional solid state memory mechanisms.

This approach provided the first ever proof of concept for a simple, low power, non-volatile, high density molecular chiral-based memory device. Undoubtedly, magnetic control at a molecular level holds great promise for future magnetic-based applications.

* NOTE: This abstract will be included in the conference material and distributed.