Nanostructure fabrication methods

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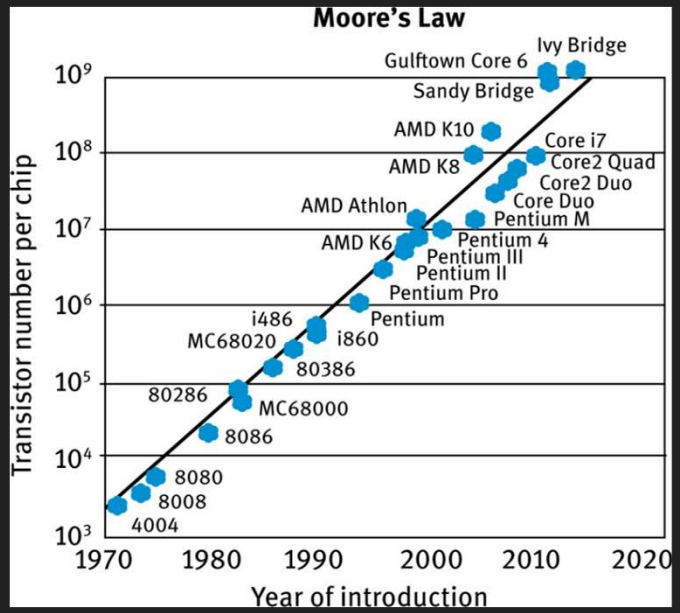
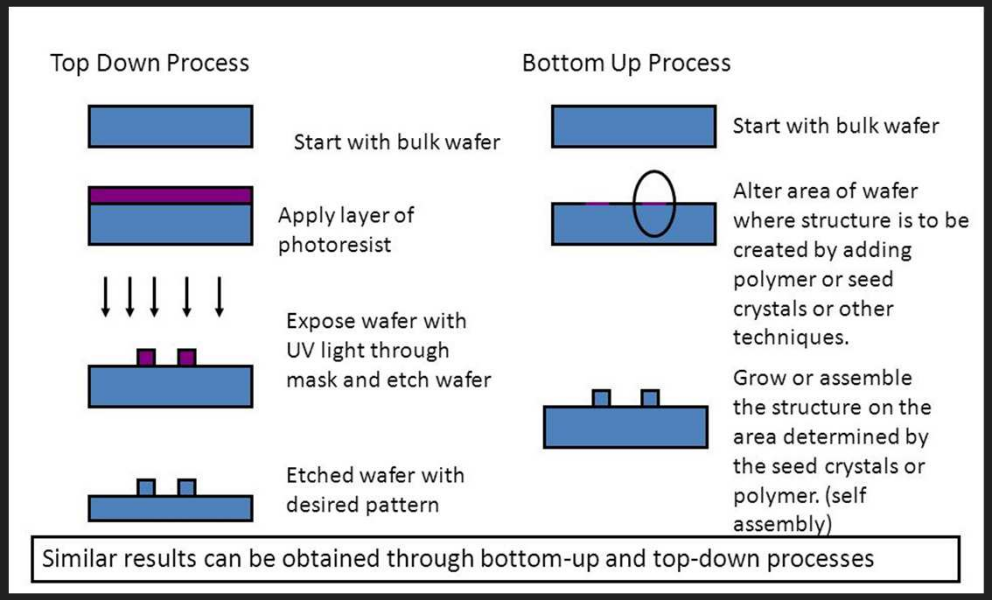
INTRODUCTION

In the last centuries, our community has developed from agrarian over industrial to a worldwide information society. The driving force and one of the most important economic component of our community is a nanostructure called microchip. According to the Moore´s law, the standard microelectronics (CMOS technology) the number of transistors per unit area doubles every 2 years and will come to its limits in the next years (2020). This puts a number of technological challenges so we have developed different fabrication methods.



INTRODUCTION

The nanostructure fabrication methods can be differentiated by "bottom-up" methods or by "top-down" methods:



TOP-DOWN METHODS

MILLING

CONVENTIONAL LITHOGRAPHY

PHOTOLITHOGRAPHY

SCANNING LITHOGRAPHY

SOFT LITHOGRAPHY

NANOSPHERE LITHOGRAPHY

COLLOIDAL LITHOGRAPHY

SCANNING PROBE LITHOGRAPHY

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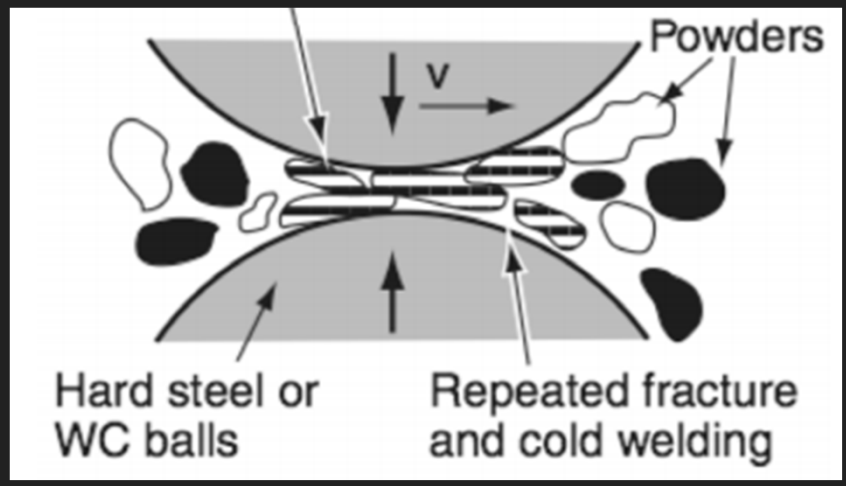

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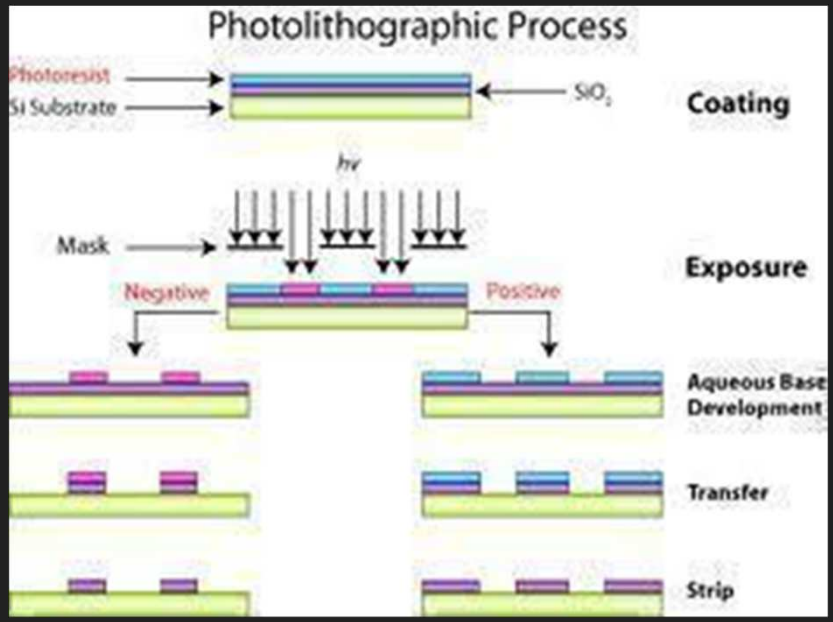

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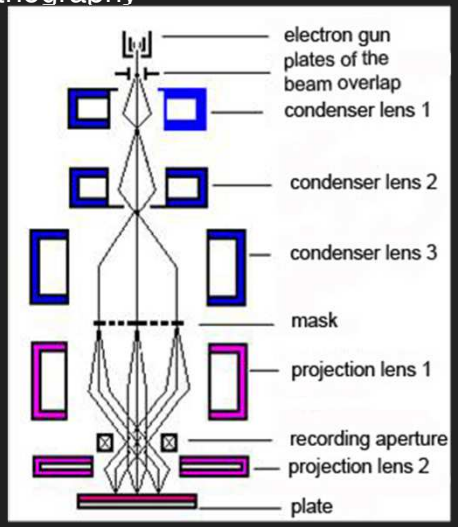
Focused ion beam lithography



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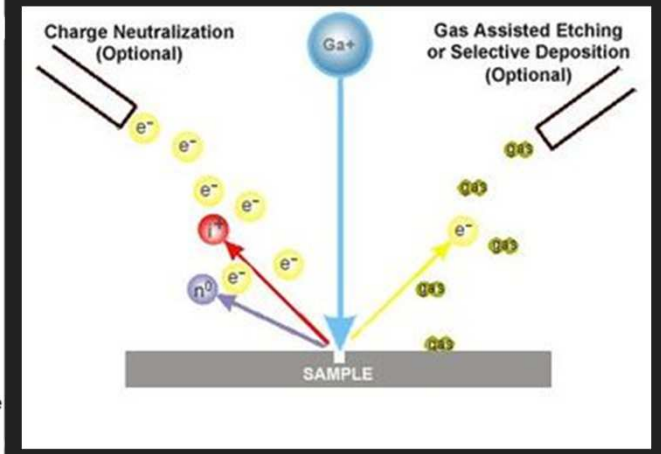

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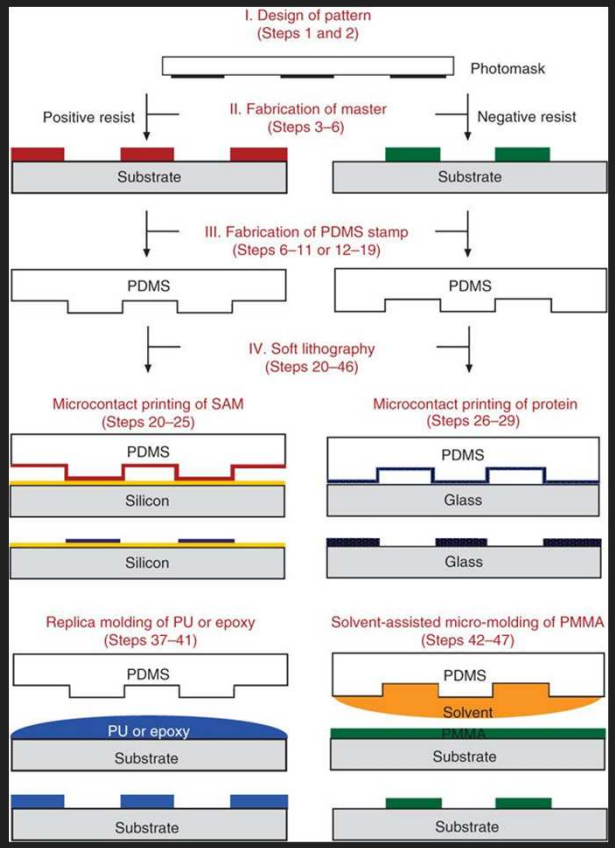

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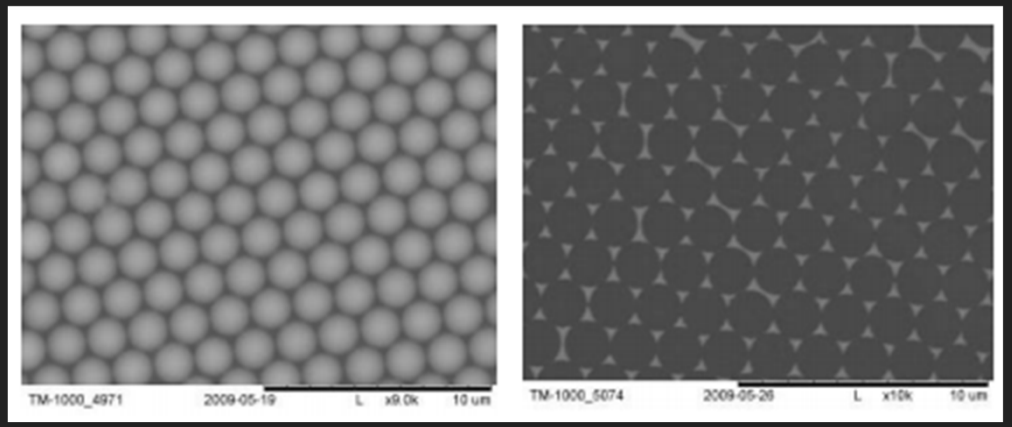

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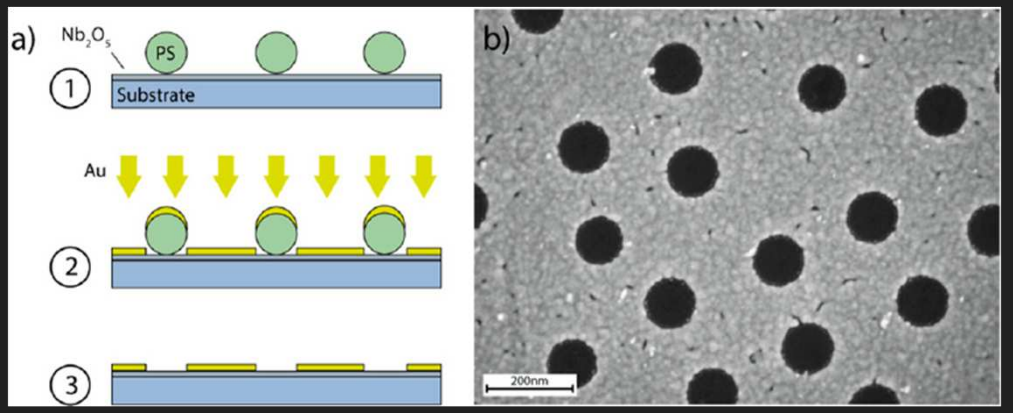

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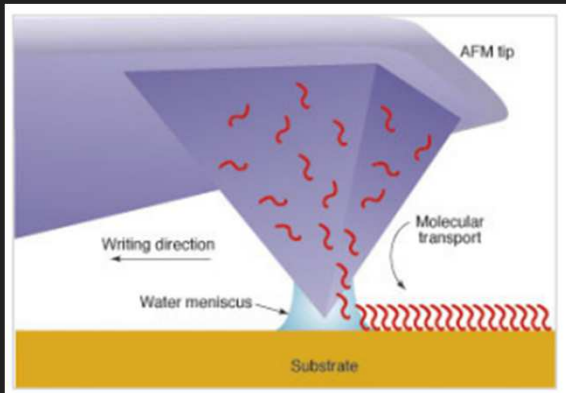

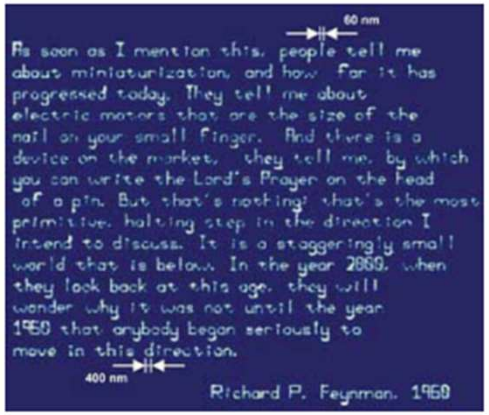

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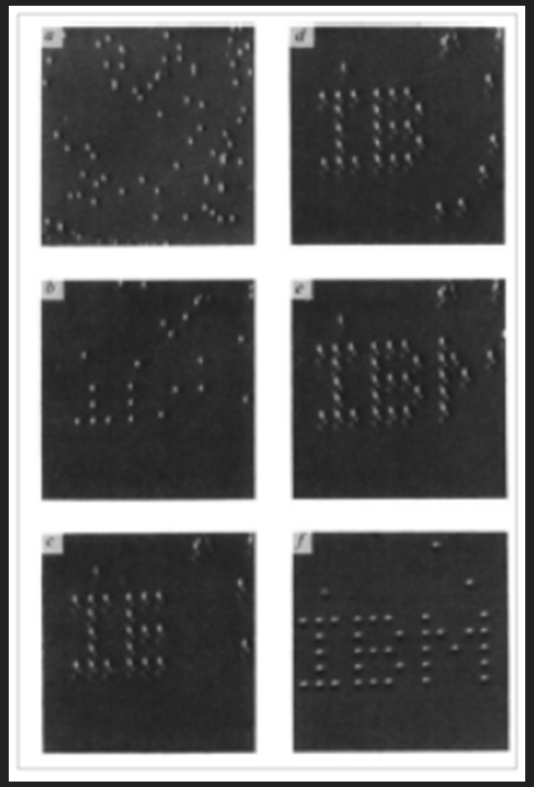

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GAS-PHASE METHODS

- PLASMA ARCING
- CHEMICAL VAPOUR DEPOSITION
- MOLECULAR BEAM EPITAXY (MBE)

LIQUID-PHASE METHODS

- SOL-GEL SYNTHESIS
- MOLECULAR SELF-ASSEMBLY

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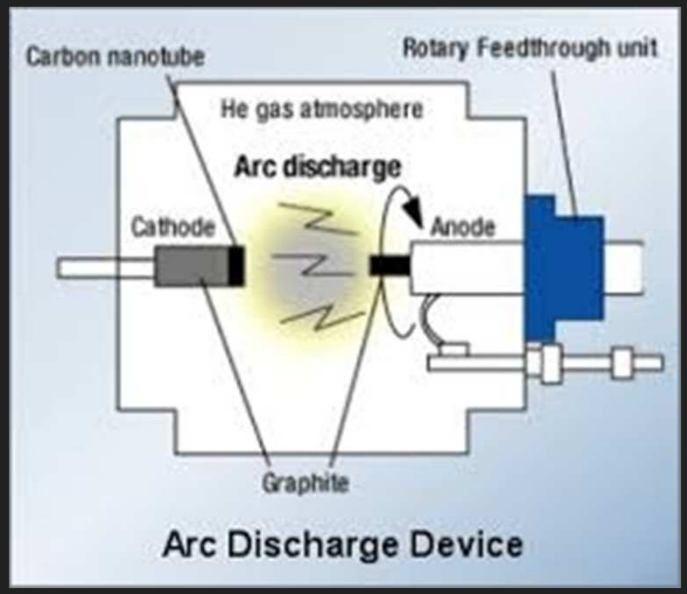

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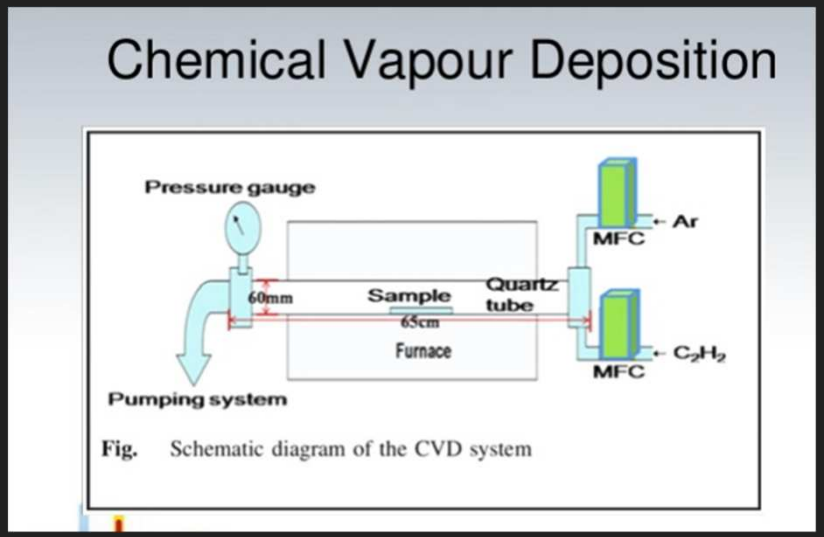

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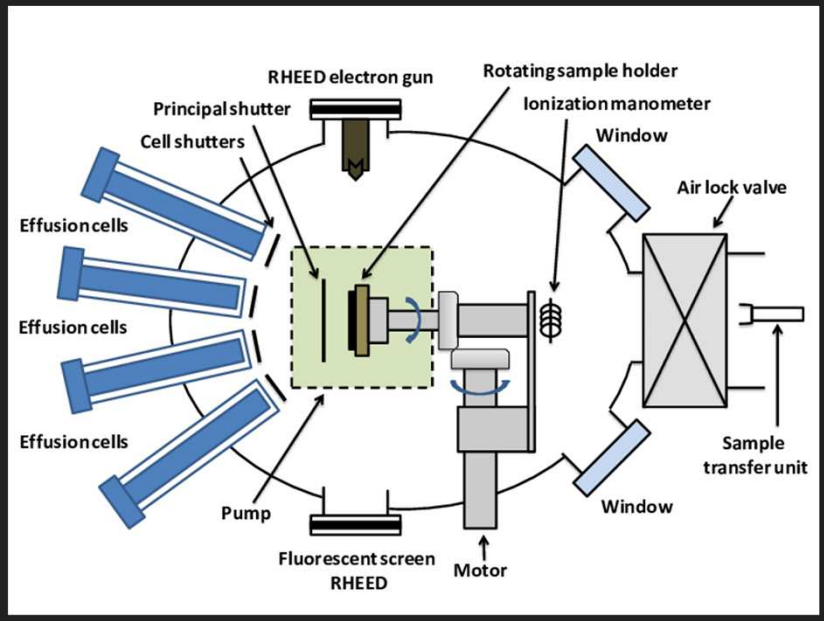

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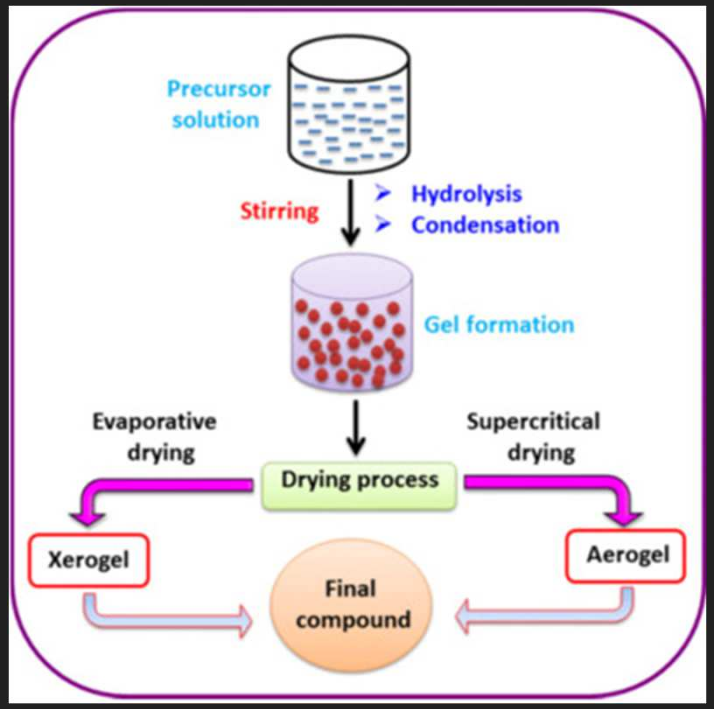

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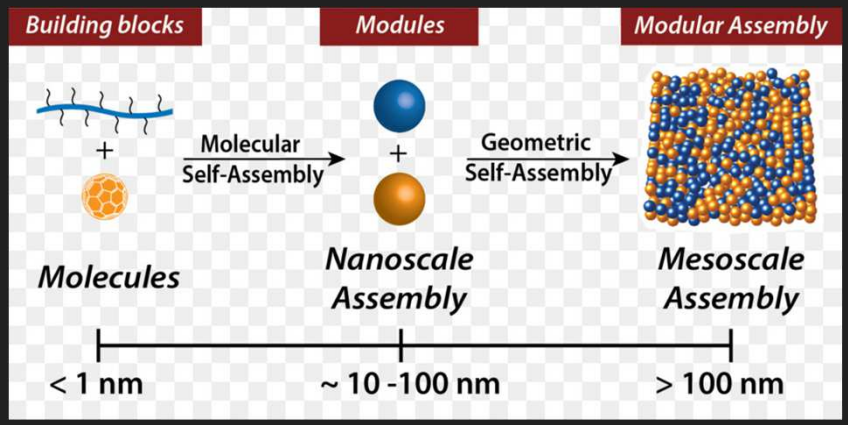

REFERENCES

Nanostructure Fabrication Methods

Nanostructure fabrication methods UJI

NANOYOU - Chapter 7: Fabrication methods