Round Table on Water less Textile Processing & 3D Printing Technology

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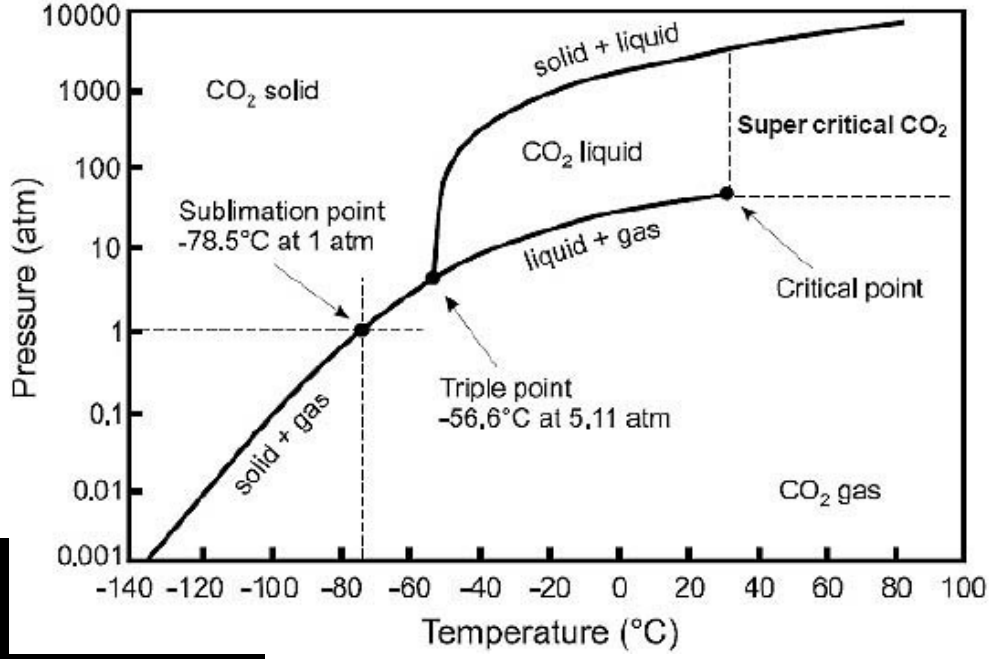
Water less Textile Processing

- The problems of current fabric dyeing technology
  - Lack of fresh water
    - 100–150 liters of water is needed to process 1 kg of textile material
    - 28 billion kilos of textiles being dyed annually (~ 4 trillion liters of fresh water)
  - Polluting ecology
    - Waste water (mostly untreated) is realized in rivers and sea (20% of all industrial waste water)
    - Adverse impact of natural flora and fauna of the surrounding region
    - Soil fertility decreases and can become toxic for cultivation.
  - Health hazards
    - Hazardous (banned or strictly regulated) chemicals:- tributyltin (TBT), pentabromodiphenyl ether (PBDE), phthalates, perfluorooctane sulphonate (PFOS), and aniline
    - disruption and can cause cancer

Water less Textile Processing

- New technological solutions
  - Pressure and heat assisted dye transfer (Phadt) to fabric.
  - Fibre surface treatment to make it more compatible to dye.
  - Supercritical CO_2 fluid as a solvent instead of water.
  - Nano-particle colour scattering



CO_2 Phase diagram

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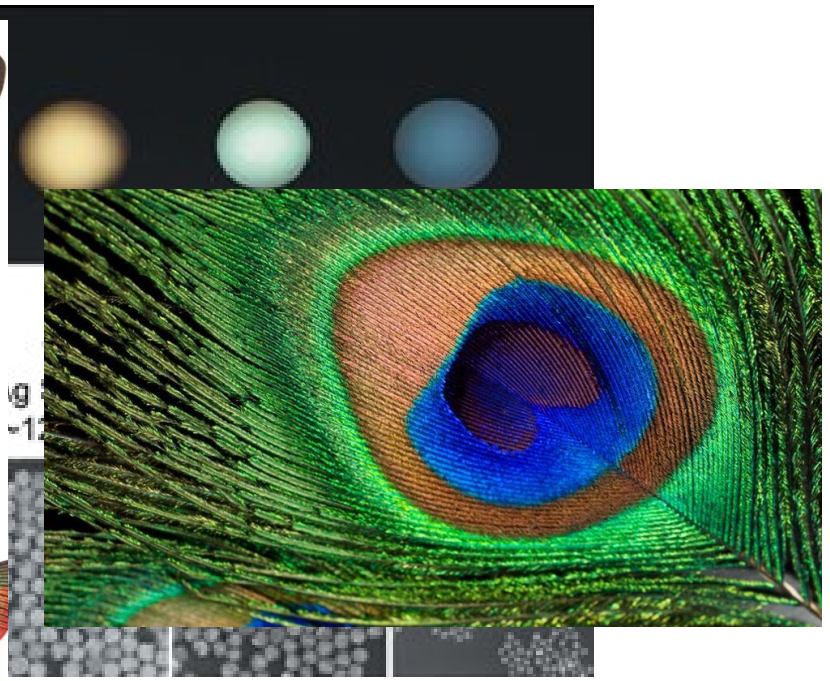

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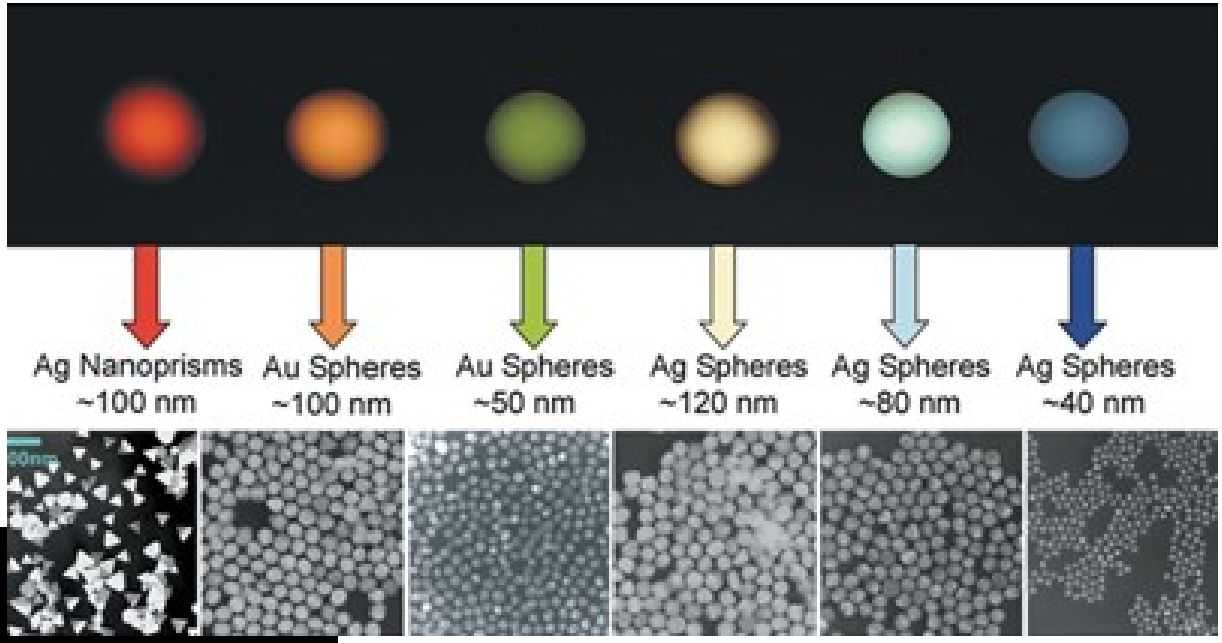
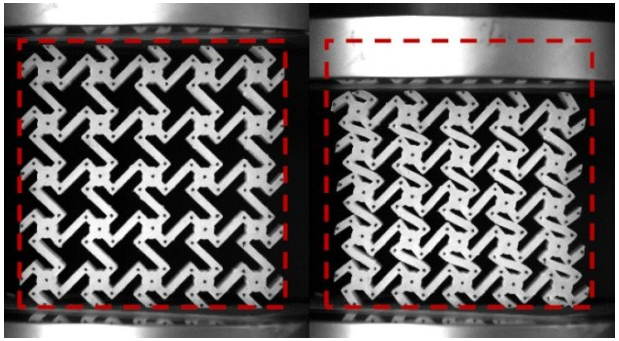


Water less Textile Processing

- The challenges ahead
  - Human Resource
    - Current manpower not skilled to deal with the new technologies.
  - Technological
    - Phadt and supercritical CO_2 processes only work for polyester, not cotton
    - Fibre surface treatment process works only for cotton fibre
  - Logistic
    - Large centralized treatment facilities, not possible in MSMEs
    - Centralized dying would require to overcome transportation and movement tax barriers
  - Financial
    - Very large investment is needed (2 to 5 million USD).
    - [illegible]tified
    - [illegible]te with the traditional dye process

3D printing and cellular textile

- Background
  - 3D structures in synthetic polymers using selective laser sintering
  - Powder, fibre, liquid gel or sheet strip can be used
  - Can be inter-woven with other fibres
  - Custom made 3D geometries, traditionally impossible shapes can be achieved
  - Directionally varying and spatially graded properties
- Market and motivation
  - Niche designer fashion clothes
  - Custom made medical applications
  - Personalized sportswear
  - Individualized protective clothing



3D printing and cellular textile

- Challenges
  - Slow and expensive fabrication process
  - Limited to synthetic fibres (natural fibres need gluing)
  - Currently limited by number of different fibre which can be introduced
- Opportunities
  - IP space is open
  - Niche market opportunities in sports, medical and protective clothing
- Future
  - Is not going to replace weaving and stitching
  - Would inculcate 3D CAD and scanning industry