70. Title: Shape memory polymers for designing responsive textiles

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Keywords: Shape memory polymers, Polyurethane, Smart textiles

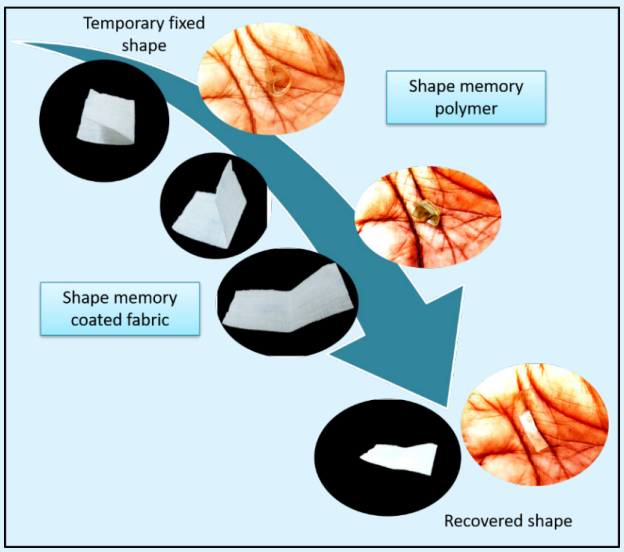
Domain: Textiles (Materials)

Summary:

Shape memory polymers (SMP) are smart polymers that respond to a suitable stimulus such as temperature, electric field, magnetic field, pH, and light by changing from one shape to the other.

The present invention describes a temperature regulated shape memory polyurethane polymer to create creaseless fabrics. Traditional methods to create creaseless fabrics generally involve formaldehyde release, or polymers have low shelf life / high transition temperatures, or fabric loses its properties over time. The SMP of the present invention has a human body transition temperature (25°C), excellent mechanical properties and tensile strength (11.83 MPa), elongation at break upto 1000%, low stiffness and works efficiently in a range of strain % and temperatures. The polymer can be applied on different textile structures/fibres (woven, knitted, cotton, wool, polyester, etc). The thermal stability, shape-memory performance, mechanical properties of the SMP are unaffected over time and the polymer exhibits increased adhesion with the fabric.

The SMP can possess multifunctional capabilities such as antimicrobial functionality and self-healing property. The SMP can be used in a wide range of smart textile products such as self-fitting masks, biomedical sutures, orthodontics, SMP based prosthetics, etc.



Advantages:

- Shape memory properties at the body temperature of the wearer
- Capable of maintaining shape memory effect, transition temperature, and thermal stability up to three years with no notable degradation
- Long lasting, efficient, time saving method for removing crease of the textile
- Fabric retains its properties like handle, comfort, air permeability, tensile strength, hand feel and avoids formaldehyde release
- Polymer acts as solid-solid phase change material that cannot leak unlike their solid-liquid counterparts

Applications: Creaseless fabrics, pattern keeping, biomedical sutures, orthodontics, dynamic aesthetic design in textiles etc.

Scale of Development: Lab-scale testing of the prototype

Technology Readiness Level: 5

IP Status: Indian Patent Application 202211034288