

Technology offer

Comfortable, wearable low-level light therapy platform

Background

LED technology has advanced applications in light therapy for indications such as inflammatory skin disorders or chronic musculoskeletal back pain. (Near infra) red and blue light stimulate the body's natural release of nitric oxide (NO), which inhibits the production of pro-inflammatory cytokines and chemokines in the injured muscle or skin (1-3).

Whereas a number of hand held light therapy devices with a relatively small active area have been brought to market, a broad uptake will demand user friendly devices, which can be strapped in a conformal way to the animal, can operate autonomously, and which can be tailored to larger surface areas (e.g. use on horses).

However, these requirements pose a hurdle as in most cases, the light treatment system size cannot be adapted to the required body shape and scale. Indeed, once scaled up, standard flexible electronics (FPC) fail to conform to body curvatures leading to a decrease in comfort and effectivity. A solution to this problem demands new or modified methods for fabrication of the electronic circuits that fulfil the conformability demand (flexing, but also stretching) (4).

Technology

To address these demands, we developed Stretchable Molded Interconnect (SMI) technology taking into account

- the optical, mechanical and thermal properties of materials in the LED engine
- the surrounding textile patch in which the LED-matrix is placed (& which can be washed)
- the device geometry (e.g. correct LED density and sufficient openings for breathability).

The unique property of SMI is that its manufacturing draws mainly from standard printed circuit board (PCB) and flexible circuit board (FCB) technologies to inherit the reliability and conductivity. At the same time, it allows soft, flexible and stretchable circuits with biomimetic haptics and high optical efficiency.

Technology offer

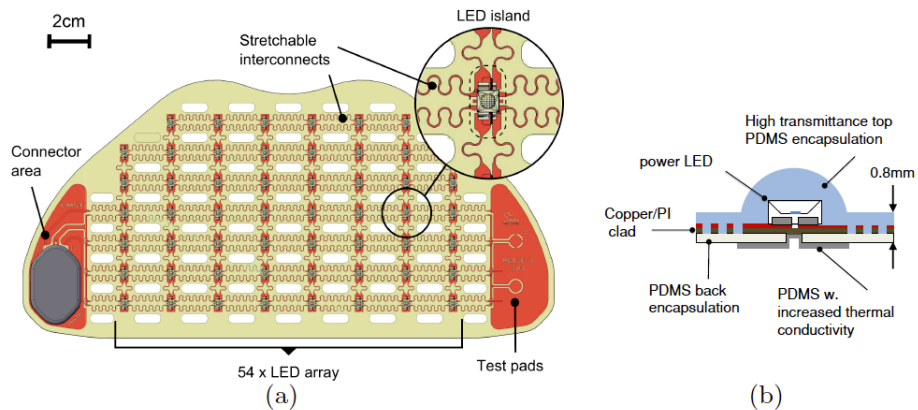


Figure 1. a) repetitive strain injury (RSI) light engine layout. b) LED engine component island cross-section.

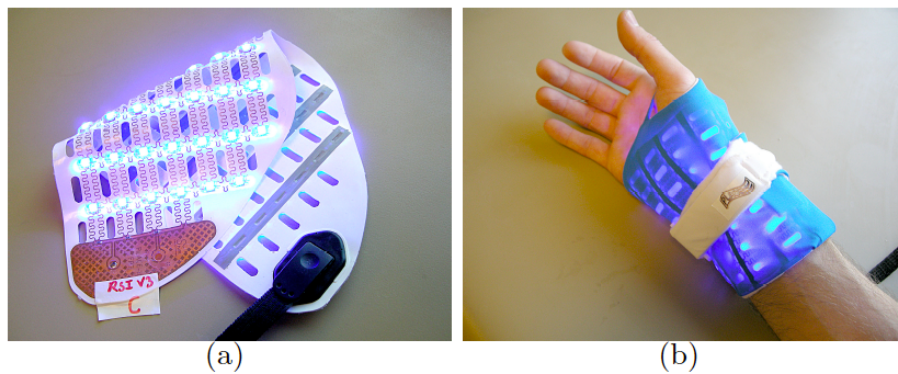


Figure 2. a) The LED engine. b) LED engine inserted into a textile wrap and worn on the wrist

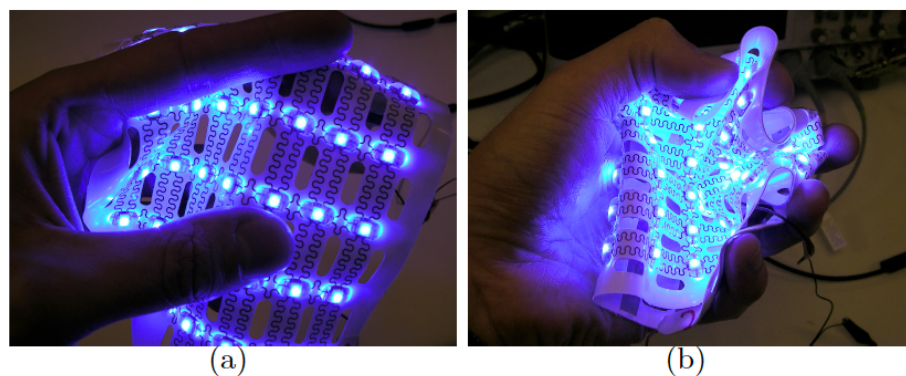


Figure 3. LED engine stretches (a) and drapes (b) under very little load.

The developed prototype allows for up to 15 min exposure with high energy visible wavelengths of 450nm, with average irradiance of 12.8 mW/cm^2 (120 mW/cm^2 peak irradiances) over an area of 158 cm^2 in DC driving mode without exceeding skin thermal safety of 42°C . As stated earlier, implementations using infra-red LEDs, or a mixture of both are equally possible, depending on the desired treatment.

Our tests with the SMI technology have shown that wearable light treatment devices are physically and technically feasible (4).

Technology offer

Advantages

- Reliable: efficiency is maintained under cyclic, tensile stretching deformation (can be repeatedly stretched without losing electrical performance)
- Comfortable: irradiance levels are within skin thermal comfort (heat-conducting layer incorporated), device is very flexible
- Breathable: the device is comparable with highly breathable textiles
- Production: can be made with standard PCB processes, as such cost-effective and high-volume production routes are available.

Possible applications in animal health

- Inflammation
- Soft tissue injuries: ligament, tendon, muscle
- Shoulder, neck, hip and back pain
- Wound healing
- Arthritis
- Post-surgery pain

IP-position

International patent application US 61148886/ EP2392198 filed in January 2009.

Partnering

We seek partnerships to explore wearable light therapy technology for indications of interest. We are open to partnering for further (pre)clinical research and/or identification of biostimulation protocols.

Our technology is available for licensing.

References

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Technology offer

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