Stretchable Microfluidic RF Electronics for Biopatches

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Silicone based compliant and unobtrusive wireless sensor nodes on the skin, so called biopatches or biostamps, have good potential to revolutionize precision medicine.

In much, their promise comes from being unobtrusive in similar manner as contact lenses are compared to eye-glasses. Also, they have intrinsic advantages in their compliancy and direct contact to the body in applications like physical sensors for biomechanical readout, sweat biomarker sensors, optically based non-invasive sensors for various blood stream data, and planar electrophysiological arrays.[i]

Our group initiated the use of liquid alloys for stretchable RF-electronics.[ii] The primary objective was to provide large cross-sections with high compliancy for low resistance also in larger areas and components needed in high quality RF-circuits. In addition, the liquid alloy provided a sliding contact to the embedded modules and with that contact robust against large strains. Most recently, we have introduced a very compliant and adhesive PDMS elastomer (named S3-PDMS for soft, stretchable and sticky PDMS), which not only allows for better contact to the skin but also increases the adhesion between the embedded modules and the elastomer.[iii] With these improvements, we now believe that it is possible to make also thicker biopatches unobtrusive, allowing for reusable gadgets, and circuits and devices which demand more volume. At the moment we are investigating how such biopatches should be used in biomechanical medicine. Our technology development is built on batch-wise printed circuit board production with good prospects for medium-sized series. However, to truly revolutionize the precision of precision medicine, the continuous sensoric feedback that supports the medical treatment should be tailored for each person's needs. Hence, we aim for serial production of very small customized series of sensors as prescribed by your doctor.

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