

Jongho Lee ¹ and Namyun Kim ¹

¹GIST, Korea, Republic of

Flexible and stretchable technologies have been attracting attention due to their potential applications such as a wearable sensor, soft actuator, and mobile electronic device. To realize stretchable electronic device, stretchable interconnectors and backplane should be applied for electrical connection and mechanical support. One of the imposing technology in stretchable electronics is to use thin film-based serpentine interconnectors that can stretch and flex without significant resistance change. This technique also enables interconnectors to be integrated with commercial silicon-based electronic devices. However, additional elastomer backplane for mechanical support limits the reusability and scalability because it easily crumpled or adhered by itself.

In this paper, we report free-standing stretchable sensor array using stiffness design of interconnectors without any backing elastomer substrate. A key factor for realizing the sensor is the design of highly stretchable interconnectors and relatively stiff frame that surrounds the sensor to withstands higher stress under handling. The sensor can be reused more than 50 times after repeating use and cleaning process without any electrical disconnection. For further application, the sensor array having 25 contact pads is attached to human skin to acquire electromyographic(EMG) signals. In demonstrations, single sensor array acquires multiple distinct EMG signals from different muscles in real-time and the acquired signals are directly converted to controlling signals to activate or deactivate home electronics. The presented results provide different approaches in stretchable electronics that can also be applied to the stretchable display or mobile electronic device.

This work was supported by the Technology Innovation Program (Development of core technologies on materials, devices, and processes for TFT backplane and light emitting frontplane with enhanced stretchability above 20% with application to stretchable display, 10079974) funded by the Ministry of Trade, Industry & Energy(MOTIE, Korea).