

Printable Rollable Battery with UV-curable Solid Electrolyte for Wearable Purpose

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The need for flexible and wearable devices is catching up with the rapid growing IoT gadgets and big data monitoring system development. For instance, wearable sensors can help monitoring patients' status, like blood pressure and heartbeat rate, continuously and can even carry out a diagnosis or deliver drugs.¹⁻² The flexible display³ is one of the key components to realize flexible smartphone and screen display which are always fantasies in the technology industry.

Thus, as one of the technical challenges to realize flexible and wearable devices, the flexible battery has drawn great attention recently. To work as a power source of wearable devices, batteries must be flexible but has enough mechanical strength to withstand bending and stretching. However, the conventional liquid electrolyte cannot work without separator which implies difficult fabrication and costly mass production process. To compare with conventional liquid electrolyte, gel electrolyte has the higher mechanical strength to work as a free-standing electrolyte to prevent short-circuit during bending and allow multilayer stacking structure of the battery.⁴

In this paper, a printable rollable primary battery is developed with a UV-curable polymer electrolyte which can be cured within seconds to support the structure during rolling. All current collector and active material layers are printed on a flexible polymer substrate. This simple printing fabrication method is highly adaptable in the industry and allows high repeatability.

NAMI's rollable battery provides stable nominal potential, high power density and the only slight voltage drop upon rolling which is promising to be applied to real flexible electronics.

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