Lignin-based solid-liquid triboelectric nanogenerator for corrosion and wear monitoring

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Due to wear or corrosion, the coating degrades continuously in the process of application in service environment resulting in the loss of its ability to protect the substrate. Unprotected workpieces in harsh conditions will rapidly reduce their service life and have high property and safety risks while wear and corrosion monitoring help to prevent the risks. Therefore, it is of great significance to monitor the wear or corrosion of coating during application, especially an *in-situ* method that can monitor the wear or corrosion of coating in real time. As an emerging technology, triboelectric nanogenerator (TENG) can transfer the mechanical energy into electricity. Some previous studies find that TENG has very good response to coating properties, which makes it possible to detect coating conditions. In this report, a TENG is developed based on lignin-based polyurethane coating. It is found that the developed TENG can generate a corresponding electric signal with different wear or corrosion states, which can be used to evaluate the coating degradation under wear and corrosion conditions. It is believed that water penetration into the coating and wear causes the increase the surface roughness and the decrease of the thickness of the coating are the main reasons affect the TENG signal output. The signal is generated by the coating-water contact separation motion, which reflects the degradation of coating performance without additional equipment, providing a potential new scheme for the *in-situ* coating monitoring.

Keywords: Triboelectric nanogenerator, *in-situ* monitoring, lignin, corrosion, wear.

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