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A novel electrode material for spark switches

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Although W-Cu alloy is widely adopted in breakers and spark switches as a kind of anti-ablation material, a series of problems including restrike, flashover, etc. still exist. For spark switches in pulsed power equipment, electrode erosion will cause a lot of problems. Not only the electrode surface, but the insulator surface can also be altered from shot to shot. Therefore, the selection of electrode material is vital for the stability and lifetime of spark switches. In this study, W-Ni-Fe alloy (90% mass percentage of tungsten) was utilized as the electrode material innovatively. W-Cu alloy (90% mass percentage of tungsten) was also adopted as a reference. A test platform including a microsecond time scale pulsed current source, loads, a chamber, and a diagnostic system has been established. Current and voltage waveforms were recorded by a Pearson coil and a North Star probe, respectively. Both the two pair of electrodes were tested for 10000 shots (~22000 C transfer). Both the two kinds of electrode were observed and measured by a confocal microscopy and an aspheric surface measuring instrument every 2000 shots. And the elements of the surface were also determined by XPS and XRD methods. The results demonstrated that W-Ni-Fe alloy was much better than W-Cu alloy when they were in spark switches.

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