Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.
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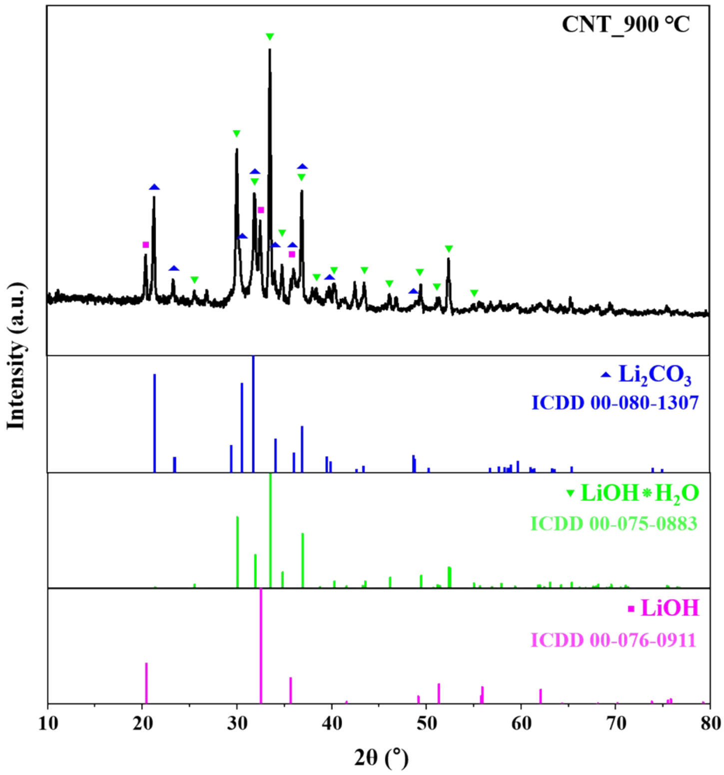

Fig. S1. XRD pattern of mixture heat-treated with CNTs

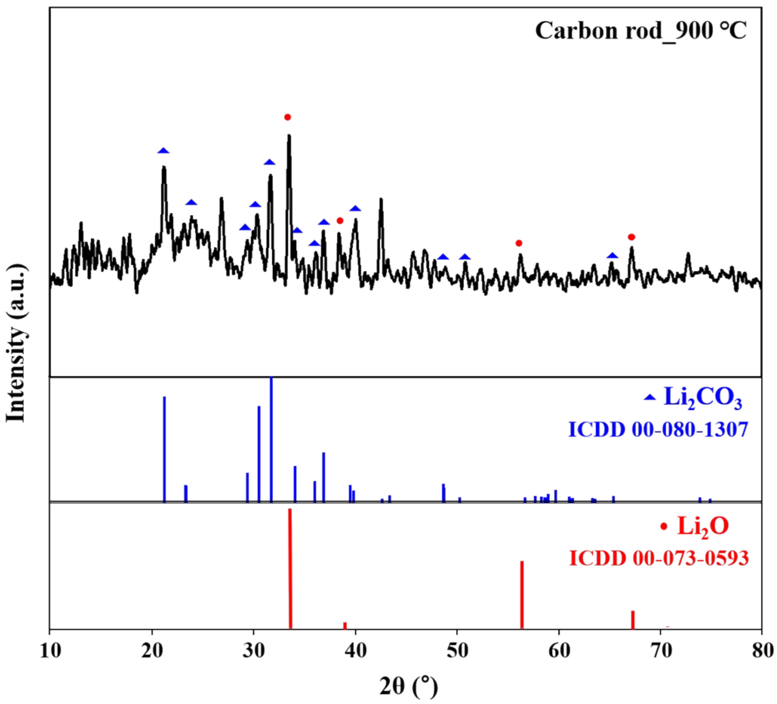

Fig. S2. XRD pattern of a mixture heat-treated with a carbon compound synthesized with a carbon rod

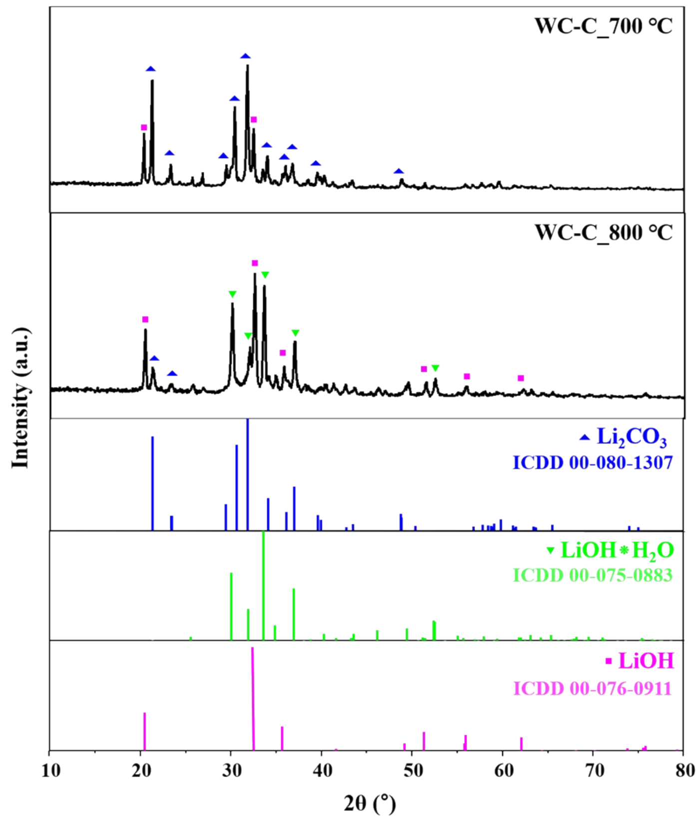

Fig. S3 XRD patterns of mixtures heat treated at different temperature conditions with WC-C

Considerations related to WC-C powder production costs

The costs required to produce WC-C powder include the cost of tungsten electrodes to generate nano tungsten particles and the cost of xylene solution, a precursor to carbon. And the power required to generate plasma must be added to this. We produced about 5g of WC-C powder per hour from one plasma, and the length of 1 pi tungsten wire consumed was about 4mm. In the case of xylene, plasma is generated in a 100 ml solution, and at this time, xylene can be continuously reused as long as it does not volatilize. Therefore, it can be said that the cost of tungsten and xylene consumed to produce 5g of WC-C powder is not high. Therefore, the cost factor that needs to be looked at most carefully is the power consumption required to generate plasma. We generated plasma under discharge conditions of 2.0 kV, 15 kHz 1.0 μs to produce 5g of WC-C powder. However, in order to further increase production, we conducted experiments by further increasing the frequency and pulse width under discharge conditions. We attempted synthesis at a higher pulse width of 2.0 μs and a frequency of 25 kHz, and the synthesis rate rose to approximately 8g/h. In order to calculate the required energy at this time, the current and voltage waveforms of the plasma power were analyzed, and the consumed energy was calculated using these waveforms as follows. The energy input per pulse is calculated by $E = \int_0^t VIdt$ where E represents the energy (energy per pulse), V, I, and t represent the voltage, current, and pulse width, respectively. The average energy input in 1 s, E_{avg}, is calculated by $E_{avg} = E \cdot f$ where E and f are defined as energy input per pulse and frequency. As a result, it was confirmed that approximately 7 J of energy was consumed per second. This is equivalent to about 25 kJ per hour and can be said to be very low energy. The reason for this low energy consumption is the use of pulsed waveforms. In other words, the pulse time for discharge is very short, at microseconds, so the input power is very low. Since this low energy is much lower than that of ordinary electric heating appliances, we think we can say that the cost required to produce WC-C is very low.

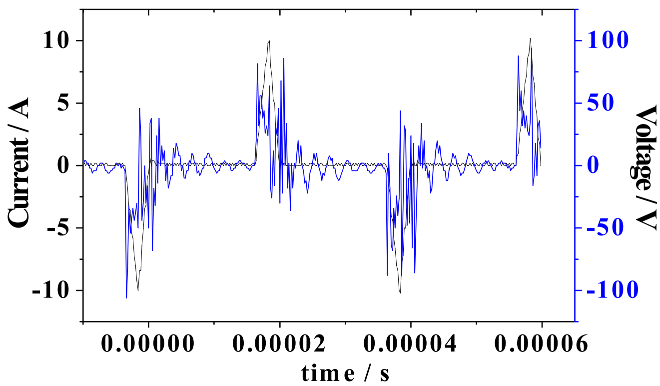

Fig. S4 Voltage and current waveforms of the formation of discharge under pure xylenes liquid.

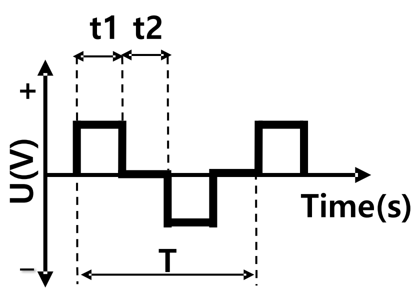

Fig. S5 Waveform of bipolar pulsed power for plasma