Nanosecond pulse for enhancing electrocoagulation wastewater treatment at a low specific power consumption

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1. Introduction - Electrocoagulation (EC) is a promising technology to clean wastewater due to it is high efficiency and simple design [1]. Unfortunately, the intensive use of electrical energy has been a barrier to spread this wastewater treatment technology from laboratory to large scale applications [2]. This work proposes the use a nanosecond pulse source (NSP) to improve the chemical oxygen demand (COD) removal efficiency, a widely used indicator of effectiveness of wastewater treatments, and simultaneously reduce the specific power consumption (SPC) respect when a direct current source (DC) is used.

2. Experimental - All experiments were carried out by using municipal wastewater from the sewage treatment center of Nagaoka city, Japan. The EC reactor consisted of four aluminium electrodes connected in monopolar-parallel mode using either a NSP or DC source. Operational conditions, such as applied voltage, pulse frequency and pulse width were adjusted to avoid a breakthrough through the EC medium. Specific power consumption comparison between NSP and DC was performed under a same COD removal efficiency condition.

3. Results and Discussion - Fig. 1 shows that use of NSP allowed the EC operation at higher voltages respect to DC, with no breakthrough of EC medium. Moreover, Fig. 1 illustrates that NSP specific power consumption was systematically below DC within the whole voltage range.

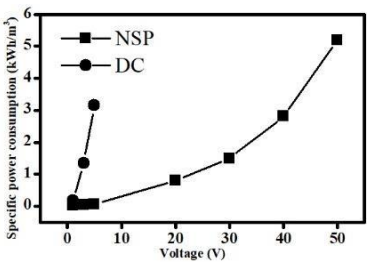
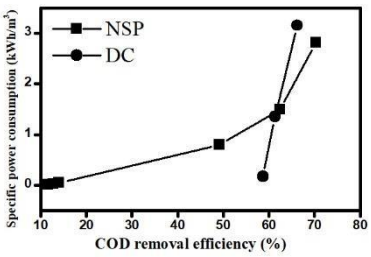


Fig.1. The specific power consumption as a function of voltage

Fig. 2 shows similar NSP and DC specific power consumption (1.5 kWh/m^3) at a similar COD removal efficiency (60%). Moreover, have a large effect on reducing the operational cost and spread this technology, for instance, in municipal sewage center.

Fig.2. The relation between SPC and COD removal efficiency

Fig. 2 depicts that use of NSP could increases the COD removal efficiency over 60% at a less specific power consumption compared to DC.



4. Conclusions - The use of nanosecond pulse source allowed to obtain high COD removal efficiency with less specific power consumption, respect to a DC source. Therefore, the utilization of NSP source in wastewater treatment via electrocoagulation could

5. References

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