

## TurboCoag® Prevents Aluminosilicate Gel Formation during Electrocoagulation

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Electrocoagulation (EC) is a replacement for metal salts such as ferric chloride and alum in wastewater treatment. When these metal salts are added to wastewater, they dissolve into metal ions and co-ion associated chemicals such as chlorides and sulfates. However, metal ions are the work horse for the water treatment. EC works by the direct dissolution of metal ions into the wastewater without additional co-ions. It has been shown that in many cases EC is less expensive and has other advantages over chemical coagulation treatment.

The potential of EC for water treatment has been known for many decades, however broad acceptance of electrocoagulation as a replacement for chemical water treatment has been plagued by two technical issues. First is passivation of the anode which is when a coating of metal oxide is formed on the anode. This metal oxide insulates the anode, reduces conductivity, and stops dissolution. Passivation can occur within just a few hours of operation, requiring significant downtime to remove and restart treatment. Second is clogging the reactor with precipitates. The effluent flowing through the reactor may be slower than the formation of the desired precipitate which then settles in the reactor and significantly retards the water flowing out of the reactor.

Both problems are discussed in a 2022 paper by Nael G. Yasri et. al<sup>1</sup>. The authors discuss the removal of silica from produced oil water where they state “aggregation of aluminosilicates...will likely occur at the electrode/solution interfaces. These aggregations form a gel structure ... the particles rearrange over time and slowly nucleate to form denser and harder gel or glassy-type precipitates.” It is these hard glassy-type precipitates that stop the EC process and are exceedingly hard to remove from the surface of the anodes. This is the process known as *passivation*.

Avivid has a unique solution to these issues: **the TurboCoag® reactor**.

**TurboCoag®** is fundamentally a Tesla pump which consists of flat plates rotating on a shaft. Operating without impellers, it relies on the drag force of the water on the plate to circulate the water within the reactor. While the Tesla pump is not quite as efficient as modern impeller pumps, it moves water very effectively. **The anodes in TurboCoag® are circular disks rotating on a shaft.** The addition of a proprietary abrasive into the reactor, which circulates at high speed with the effluent, removes the aluminosilicate gel layer before it can harden. **Passivation is thereby eliminated in the EC reactor.** The result is a self-cleaning electrocoagulation reactor.

**TurboCoag®** takes advantage of the Tesla pump action by circulating water *in* the reactor at high velocity independent of the flow rate *through* the reactor. Consequently, **sludge cannot accumulate in the reactor**; precipitates are kept in suspension inside the reactor and precipitation occurs outside the reactor in a settling tank.

The effectiveness of this approach is proven out by two facts: 1) the interior of the TurboCoag reactor remains clean during operation and 2) the anodes, which are 0.75 inches thick when new, are dissolved to less than 0.01 inches thick when they are replaced.

To learn more about Avivid’s TurboCoag® reactor and how it can reduce your wastewater treatment costs, contact Avivid for more information at [info@avividwater.com](mailto:info@avividwater.com) or call us at 303-776-7000.

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<sup>1</sup> Nasri, N. G., Ingelsson, M., Nightingale, M., Jaggi, A., Dejak, M., Kryst, K., . . . Roberts, E. P. (2022). Investigation of electrode passivation during electrocoagulation treatment with aluminum electrodes for high silica content produced water. *Water Science & Technology*, 925-942.

## THE COMPETITION



LEGACY ELECTROCOAGULATION REACTOR

ANODES PASSIVATION  
(FOULING)

INTERNAL SLUDGE  
BUILDUP

## AVIVID WATER TECHNOLOGY: TURBOCOAG®



TURBOCOAG® REACTOR



NEW ANODE:  
0.75" THICK



SLUDGE-FREE REACTOR  
INTERIOR



USED ANODE: 0.05"  
THICK, DAY 40