

Boron Doped Diamond (BDD) Electrodes APPLICATIONS

Oxidation

BDD anodes generate highly reactive **OH° radicals** directly in water. These very strong oxidizing agents can destroy substances which are difficult to degrade with other methods. In waste treatment we have the challenge of removing **COD** and/or **TOC** and also substances like cyanide as well as non-biodegradable, toxic organics, **EDTA** or **surfactants**.

Most of these substances can be degraded by oxidation processes.

BDD systems are the first choice when it comes to treatment of liquid waste which is difficult or too expensive to dispose of.

In some cases, a partial oxidation can be done to **increase bio-availability** of phosphate or nitrate, thus opening a **low-cost** path to **treatment in biological sewage** treatment plants!

Disinfection

BDD disinfection is a well proven, established technology. In the field of **fresh and process water treatment** BDD electrodes can be used to **disinfect**

- fresh water, sea water
- pure water (RO/DI) for production
- waste water with biological contamination

One interesting application is the **disinfection of cooling water**. To date, this water is treated with **liquid biocides**, which leads to **high costs** in occupational health and safety.

BDD electrodes produce ozone and free chlorine, using water and the **dissolved salts** as a **resource**.

Another application is the **disinfection of pure water (RO/DI)**: where **UV lamps** have just a local effect, **BDD's** produce **ozone** „in situ“ and disinfect also pipes and vessels, thus preventing the formation of **biofilms**.

Synthesis

BDD's special **mechanical** and **electrochemical** properties can be used in selected synthesis reactions using either **anodic** or **cathodic reactions** instead of conventional oxidation or reduction processes. The **incentive** here is the possible purity of the reaction products (no conventional oxidizing/reduction agents involved !) with a more efficient production method.

Cathodic reduction processes are also possible and have been subject to scientific research.

Some well-known examples of oxidation-based synthesis applications are production of

- peroxymonosulfuric acid
- peroxodiphosphate
- peroxycarbonate

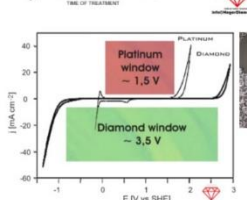
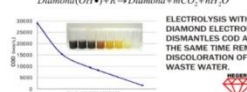
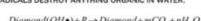
Another possible application is the removal of **organic contamination** from **inorganic products**.

Although **synthesis** may be the most complex application of **BDD's**, the **economical potential** is very **high**.

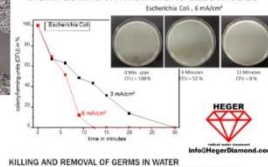


WASTE WATER TREATMENT WITH DIAMOND ELECTRODES

DIAMOND ELECTRODES PRODUCE OH RADICALS IN WATER WITH ELECTRICITY ALONE. OH RADICALS DESTROY ANYTHING ORGANIC IN WATER.



DISINFECTING WITH DIAMOND ELECTRODES



KILLING AND REMOVAL OF GERMS IN WATER WITH DIAMOND ELECTRODES. EXAMPLE: ESCHERICHIA COLI

For further reading, we recommend the following paper by Alexander Kraft: „Doped Diamond: A Compact Review on a New, Versatile Electrode Material“

