Boron Doped Diamond (BDD) Electrodes

APPLICATIONS

**Oxidation**

BDD anodes generate highly reactive OH\(^\cdot\) 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
- peroxydiphosphate
- peroxy carbonate

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.

Success Stories:

Diamond Electrodes

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

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