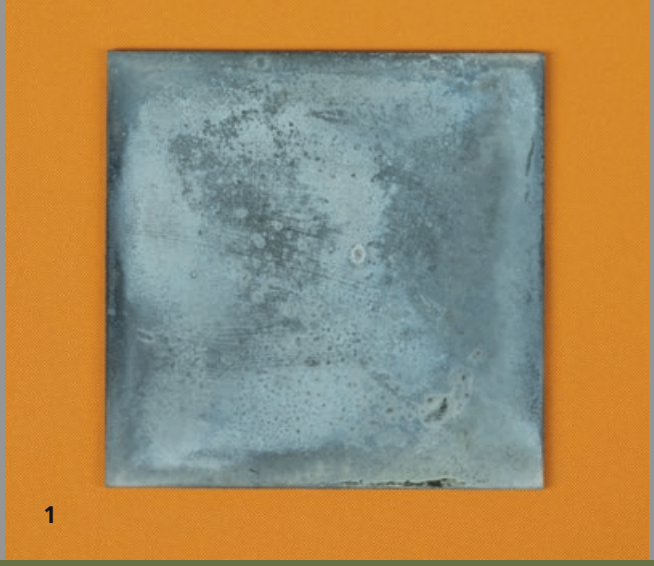

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MATERIALS FOR ELECTROCHEMICAL DEGRADATION OF PHARMACEUTICAL RESIDUES IN WATER

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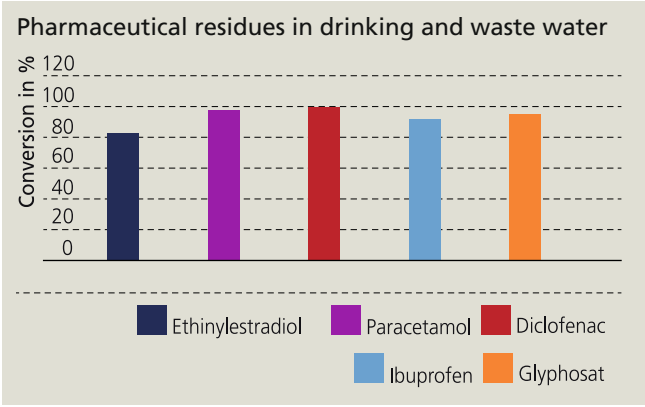
Pharmaceutical residues in surface water and groundwater pose new challenges for the water treatment in many regions. Established methods are frequently found lacking when it comes to removing such substances, which continue to leak into water bodies, contributing to the propagation of antibiotic resistances and infertility. It is known from past projects that even stable substances, such as halogenated hydrocarbons or nitro-aromatic compounds, can be oxidized electrochemically to produce CO_2. Furthermore, the reductive transformation of these target agents to produce less environmentally toxic materials is possible for some substance classes. Such possibilities are currently being investigated under the BMBF funding initiatives "InnoEMat" and "MachWas" within the joint projects "SONEKTRO" and "KERAMESCH". "SONEKTRO" – a project in cooperation with CEEC Jena – is looking for alternatives for boron-doped diamond anodes (BDD), which represents the most powerful anode material for the electrochemical degradation of pharmaceutical residues to date. One great advantage of BDD is its high overvoltage for the anodic development of oxygen, enabling the complete destruction of organic compounds. However, BDD is very expensive, which has generated great practical interest for potential alternatives. With this in mind, IKTS researchers have synthesized and examined various semiconducting mixed-oxide phases – with and without noble metals – onto ceramic supports. The result was that SnO_2-based systems turned out to be particularly effective. Also, an array-shaped ultrasound source was integrated into the electrode structure in initial experiments, thanks to which near-surface transport processes close to the electrodes intensified and electrochemical activation was supported. The "KERAMESCH" project investigates a method for removing pharmaceutical and pesticide residues from sewage water through electrochemical conversion, resulting in less harmful substances. Fraunhofer IKTS develops and tests low-cost catalytically active iron alloys for this purpose. These alloys are deposited onto a ceramic foam support to realize fluidized-bed reactors for high water flow capacity. Early results show that diclofenac, for instance, was reduced electrochemically to a relatively high degree. Tests are currently being run for other compounds, such as ethynylestradiol (hormone) or erythromycin (antibiotic). For these analyses, C-14-labeled compounds are used as well, so that trace substances can be detected without elaborate concentration.



1 *SnO_2-mixed oxide anode on Al_2O support.*
2 *Anode with piezoelectric transducer.*

INNOEMAT Innovative Elektrochemie mit neuen Materialien
MachWas MATERIALIEN FÜR EINE NACHHALTIGE WASSERWIRTSCHAFT
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