

## Enhanced nitrate reduction by addition of different organic substances

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The emission of nitrate is one of the most common causes of groundwater pollution. This contamination is mainly due to the nitrogen fertilizers used in agriculture for many years to increase yields and productivity [1]. These fertilizers are transported into the groundwater as nitrate ( $\text{NO}_3^-$ ) in large quantities. In many areas of Germany, the limit of the current drinking water regulation (Trinkwasserverordnung) of 50 mg/l is already exceeded. Aquifers may have a nitrate reduction capacity by sulphide and organic carbon, which still reduces some of the nitrate. This capacity continues to decline and is finite: significant increases in nitrate concentrations and breakthrough to drinking water wells are therefore expected in the future [2].

In order to reduce nitrate pollution in groundwater and, above all, in drinking water, a possible increase in nitrate reduction is being explored in this research series. For this purpose, column tests are carried out in which the nitrate reduction is caused and enhanced by addition of glucose, ascorbic acid or ethanol. These reducing agents have been selected based on their environmental compatibility to ensure that neither environmental damage nor other risks are generated in principle within nitrate decomposition applications. Furthermore, the influence of temperature on the nitrate reduction after the addition of a denitrification-supporting substance will be investigated. Therefore, in comparison to room temperature experiments, column tests at 10 °C have been performed in accordance with the mean annual temperature of groundwater in Germany.

In addition to enhanced nitrate reduction, the results show a distinct decrease in electrical conductivity in column tests with addition of organic carbon as compared to columns with a natural nitrate reduction capacity.

[1] DWA – Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall [Hrsg.] (2015): *DWA-Themen, Stickstoffumsatz im Grundwasser*; Hennef

[2] DVGW – Deutscher Verein des Gas- und Wasserfaches e.V. [Hrsg.] (2016): *Grundsätze und Maßnahmen einer gewässerschützenden Landwirtschaft*. Technische Regel – Arbeitsblatt DVGW 104 (A); DVGW, Bonn