

Statement of the KDM Strategy Group "Marine Mineral Resources" on the radioactivity of manganese nodules

A recent publication points out the natural radioactivity of manganese nodules and potential health hazards associated with inadequate handling of the nodules in research laboratories, as well as large-scale processing of the nodules in the context of potential future deep-sea mining (Volz et al. 2023, Scientific Reports, <https://doi.org/10.1038/s41598-023-33971-w>).

Research institutions in Germany and abroad have scientifically studied manganese nodules and their natural environment for several decades. In the Strategy Group "Marine Mineral Resources" of the German Marine Research Consortium (KDM), leading scientists from German research institutions exchange regularly on all topics related to deep-sea mineral resources.

Since the publication has caused uncertainty among experts and the general public with regards to potential health hazards associated with the handling of manganese nodules, the Strategy Group issues the following statement on the topic:

Manganese nodules are naturally occurring, slightly radioactive substances. Their radioactivity has been known for more than 100 years and has, for example, been used scientifically for age dating purposes. Measurements of gamma radiation from manganese nodules have been regularly carried out in the past, e.g. at the Federal Institute for Geosciences and Natural Resources (BGR), but did not yield values that require special radiation protection measures. The publication by Volz et al. (2023) now points to possible health hazards from the natural radioactivity of manganese nodules, by comparing the activity concentrations of various alpha emitters to currently valid exemption levels for radioactivity. According to the German Radiation Protection Ordinance, however, the specific activity in conjunction with "exemption levels" is not relevant for the assessment of health hazards, as postulated in the publication. Instead, the effective body dose under realistic exposure scenarios has to be considered. Natural radioactivity occurs in many areas of life, e.g., from cosmic and terrestrial radiation, in geographic areas with granite rocks or in various foods. Only elevated effective body doses constitute a health hazard and require specific radiation protection measures in these cases.

In reaction to the above-mentioned publication, the BGR has commissioned an independent, accredited radiological laboratory to investigate in detail the radiation exposure during typical laboratory work with nodules and during storage of nodules in confined spaces. These investigations are scientifically supervised by the German Federal Office for Radiation Protection (BfS). The study involves the analysis of the complete radionuclide spectrum in nodules to determine levels of alpha and gamma radiation as well as radon levels, and incorporates the potential effects of radiation on body organs, both externally and through inhalation. A first evaluation of measurement results shows that the effective body dose at a nodule exposure time of 8 hours per day and 250 working days per year is below the value of

1 millisievert per year, above which a person is considered as an occupationally exposed person according to the German Radiation Protection Act.

These initial results show that handling of manganese nodules for scientific research poses no health hazards when standard occupational safety measures are taken (e.g. good ventilation, gloves, hand washing, mouth protection, and use of a fume hood when dust is generated). BGR will publish the study once it is completed.

If you have any questions or wish further information, please contact:

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The Marine Mineral Resources Strategy Group is a discussion and priority-setting forum for research into marine mineral deposits, their resource potential and all other aspects of deep-sea mining, including environmental impact assessments. The development of a 'Mining Code' at the International Seabed Authority and the announcement by the Federal Government of Germany that it would seek a precautionary pause have pushed the work into a new phase.

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