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Petrophysical study of different rock types from the mining area of Freiberg, Germany

Leonie Graffmann, Martin Sonntag, and Jana Börner

Institut of Geophysics and Geoinformatics, TU Bergakademie Freiberg, Freiberg, Germany

The ore mining area of Freiberg is located in the federal state of Saxony in the east part of Germany and is characterized by hydrothermal ore mineralization.

The present petrophysical study concentrates on three different rock types from the research mine "Reiche Zeche". The set of samples contains rocks from the metamorphic host rock - Freiburger Gneiss (FG), from a hydrothermal alternated gneiss (hG) and from a pyrit-galenit rich ore vein (ore). The investigations include the determination of density and porosity as well as laboratory measurements of the Spectral Induced Polarization (SIP) in the frequency range from 10^{-3} to 10^4 Hz. Furthermore, measurements of the magnetic susceptibility and P-wave velocity were performed.

For the determination of P-wave velocity by ultrasonic measurements, the rock samples were cut into cubes (5 cm x 5 cm) under preservation of their spatial orientation. The sample set contains 17 cubes (FG - 8 cubes, hG - 3 cubes and ore - 6 cubes).

The determination of the complex resistivity was performed in a SIP - measuring cell on cylindric plugs with a length of 3 cm and a diameter of 2 cm. For the SIP-measurements 19 plugs (FG - 11 plugs, hG - 2 plugs and ore - 6 plugs) were available.

Density and magnetic susceptibility measurements were performed on 10 samples of crushed material for each rock type.

The data sets of complex resistivity and P-wave velocity measurements from rock samples of the metamorphic host rock and the ore vein were analysed with focus on possible anisotropic behaviour.