Thermally-affected Carboniferous sediments overlying thinned coal seams in Jastrzębie mine (Poland)

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Coal-bearing rocks of the south-western part of the Upper Silesian Coal Basin, Poland, locally comprise red-, grey-, and yellow-colored siltstones and breccias which overlie coal seams of reduced thickness. Possible causes for the reduction are (1) weathering, (2) thermal transformations due to igneous intrusion or (3) thermal changes as a result of coal fires over several square kilometres. To explain the reduced coal-seam thicknesses, this study focussed on the overlying rocks. Samples (6) of red-orange rocks and samples (8) of dark-grey rocks with red streaks or patches were collected from the operating Jastrzębie coal mine.

Rock compositions were identified using SEM-EDS and XRD. Apart from organic matter and primary quartz, muscovite, illite, kaolinite, clinochlore, framboidal pyrite, zircon and monazite, secondary minerals, i.e, magnesioferrite, oxyapatite, TiO_2, Mg>Fe chlorite, and hematite occur with xenomorphic habits indicative of primary-mineral substitution, and as veinlets of magnesioferrite and halite.

Compositions of dichloromethane rock extracts were identified by GC-MS. Differences in extract yield and organic components distinguish the red-orange and dark-grey rocks. A wide range of biomarkers and aromatic hydrocarbons were identified, e.g., *n*-alkanes, pristane and phytane, steranes, tri-, and pentacyclic triterpanes. For the reddish rocks, *n*-alkanes in the range from *n*-C_{15}-*n*-C_{33} show a monomodal Gaussian distribution with a smooth outline typical of pyrolysate. For the grey rocks, the distribution is bimodal. Some biomarker groups, e.g., pentacyclic triterpanes, occur only in the grey rocks. Absent compounds were possibly destroyed by heating. Maximum *n*-alkane concentrations in the range *n*-C_{21}-*n*-C_{23} in most distributions indicate that organic matter was exposed to temperatures of 350-400^{o}C at least.

The data exclude weathering as a cause of alteration. Compaction following coal-seam fires is the likely cause of seam thinning.

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