

GEOLOGICAL EVIDENCES ON MINE GAS EMISSIONS OF A SELECTED ALLUVIAL GEM DEPOSIT IN PELMADULLA, SRI LANKA

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Mining safety should be a key concern in any kind of subsurface mining work. In gem mining industry of Sri Lanka, accidents due to inhaling toxic gases have been frequently reported from the alluvial gem deposits of Ratnapura gemming fields. This study was conducted to identify geophysical and geochemical characteristics of a selected alluvial gem deposit in Pelmadulla, in order to identify the possible causes for toxic mine gas emissions.

Eighty four sediment samples were collected down the three sedimentary profiles in the selected alluvial gem deposit using auger drilling method. Then distribution of the organic functional groups and the inorganic elements in the sedimentary profiles were determined using Fourier transform infrared spectroscopy (FTIR) and X-ray fluorescence spectroscopy (XRF) methods. Grain size distribution of the deposit was determined by dry sieving method. Total organic matter (TOM) and inorganic carbon content were measured using loss on ignition method. Total organic carbon (TOC) of each sample was measured using walkley-black wet oxidation method. In addition, all the samples were analyzed to determine selected physical and chemical properties such as pH, Eh, elution conductivity and moisture content.

A peat layer was found at the bottom. According to the analysis, it contains high level of organic matter, organic and inorganic carbon, halogen and sulfur contents. High TOC/TOM ratio and hydrocarbon (aliphatic and aromatic) content of peat indicate it's in the later stage of decomposition. However, carbonyl groups in the middle layers of the deposit indicate humic substances resulted in active decomposition. In general, it has been observed that both biological and non-biological processes of decomposition can produce various gases (CH₄, CO, CO₂, H₂S, Halogenated volatiles) under prevailing reduced and acidic conditions particularly in peat. In addition, sedimentary sequence in the deposit (clay, sand, peat) may facilitate for the soil gas accumulation. The generated gaseous products escape from the peat and accumulate within sand formations due to the presence of thick clay cap on top of the sequence.
