AU-BEARING CONGLOMERATES OF WITWATERSRAND: GEOCHEMICAL EVIDENCE OF VOLCANOGENIC-HYDROTHERMAL ORIGIN

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A comparison of structural and geochemical features inherent in productive vs. barren parts of 7 conglomerate reefs, from the Dominion Reef (the bottom member) to the Black Reef (top), is carried out. Unlike the barren parts, Au-bearing ones associate with asymmetrical ‘channels’ typical of the near-fault depressions. Auriferous conglomerates carry particles of effusives and are constituted practically entirely of quartz. They are depleted in Ba and Rb (low content of clastic feldspar) and rich in siderofiles (Fe, Ni, Co, Mn) and chalcofiles (Cu, Zn, Pb, Hg): productive/barren ratio ranges from 10 to 50. Barren tuffaceous conglomerates are rich in siderofiles only (Fe, Ni, Co, Mn, V, Cr, Ti) and Cu (presence of clastic base volcanic material), whereas Au-bearing parts, in addition, are chalcophile-rich because of development of pyrite-poly-sulfide mineralization (‘black smokers’-like). The computer image tube and local laser analysis techniques used in studies of polished sections revealed that quartz pebbles in the Au-bearing parts are chemically homogeneous and regularly oriented. This is typical of an in situ-formed material (e.g., silicagel). Enhanced carbon, Au, U, and trace element contents in the pebbles occur in microfissures of later origin. Thus, a leadership of SEDEX in formation of Au resource in metaconglomerates (60–70% of total) can be presumed (in addition, the sulfide S-isotope data are taken into consideration). Locally, reducing conditions favorable for deposition of auriferous sulfides were sustained by this process. The share of paleo-placer accumulation here has been small (0.1% of total). The post-sedimentation hydrothermal activities enabled re-mobilization of the SEDEX-deposited and paleo-placer gold, along with additional input of the metal (20–30% of total).