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Trace elements of stromatolitic, and microfossil-bearing massive and laminated cherts from the Strelley Pool Formation

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Black cherts (ca. 3.4Ga) from the Strelley Pool Formation in the Goldsworthy greenstone belt, Pilbara Craton, Western Australia exhibit various lithologies, including stromatolitic, laminatied, or massive structure. Massive cherts contain abundant microfossils. Rare-earth elements and selected trace elements were measured in 17 samples of the black cherts in order to reveal their origins and depositional environments. In shale-normalized REE patterns, stromatolitic cherts show negative Ce-anomalies($Ce/Ce*_{SN}$ =0.651-0.85) and positive Eu-anomalies($Eu/Eu*_{SN}$=1.285-1.748), with LREE-enrichment(Pr/Yb_{SN}=2.658-5.918). Half of massive and laminated cherts are characterized by positive Eu-anomalies($Eu/Eu*_{SN}$=1.054-2.455) and the absence of negative Ce-anomalies, with MREE-enrichment(Sm/Yb_{SN}=1.298-3.537). All samples except one have super-chondritic to chondritic Y/Ho ratio(25.58-35.37). The variations of REE patterns and some heavy metal concentrations appear to correspond to their lithological variations, suggesting that REE and trace elements of the black cherts are clues for their origins and depositional environments. While many of empirical studies about REE+Y of Archean cherts and carbonates have indicated that Archean open water is characterized by HREEE-enrichment and weak positive Eu-anomalies, the studied 17samples do not. This suggests contributions of other components like hydrothermal water, or land water, to their origins. It is likely that massive cherts precipitated from low-T hydrothermal water because they show not only MREE-enrichment but also high levels of Zn or Pb, with not pronounced positive Eu-anomaly. Although it is, on the other hand, difficult to specify the origins of stromatoritic cherts, we imply the possibility of contribution of continental run-off.

References

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