

# SEG 2022 Conference: Minerals For Our Future

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## **The Source of Mineralization in Stratabound V Rich Deposits in the Yukon Territory, Canada: Evidence from V Isotopes**

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Vanadium is becoming increasingly more important, both for its use in steel needed to build new infrastructure but also for its use in long-life batteries. As such, new sources of V need to be discovered and exploited. A potential source is highly metalliferous shales. One of the highest grade locations is in northwest Canada, where it has been found at concentrations of approximately 0.5% over tens of metres. However, it is not clear how these form so it is difficult to develop strategies for finding larger or higher grade deposits. One of the more popular mechanisms proposed is direct precipitation from seawater, however it is not clear how such high concentrations of V could be maintained for so long if reductive trapping of V from seawater were the only source. Hydrothermal fluids are another potential source but to date no known vent site has been found near these systems.

V isotopes, measured as  $\delta^{51}\text{V}$ , offer a chance to better elucidate the source of V as V deposited in different depositional settings and hydrothermal V all have different  $\delta^{51}\text{V}$  signatures. In the modern environment  $\delta^{51}\text{V}$  is  $-0.15 \pm 0.15\text{‰}$  for hydrothermal sediments,  $-0.9 \pm 0.1\text{‰}$  for oxic sediments,  $-0.5 \pm 0.1\text{‰}$  for anoxic sediments and  $-0.2 \pm 0.1\text{‰}$  for euxinic sediments. Our results range from 0.11 to  $-0.33\text{‰}$   $\delta^{51}\text{V}$ . While a few samples are slightly heavier than the range expected for a hydrothermal source there is no alternative probable source with a positive  $\delta^{51}\text{V}$  so this is probably evidence of a minor amount of closed system behaviour. Further, while some of our results could be explained by euxinic deposition this is unlikely as there are large concentrations of barite found with the V rich horizons, something unlikely to occur in euxinic settings where all sulfate has been reduced to sulfide.