

BACTERIA WERE RESPONSIBLE FOR THE MAGNITUDE OF THE WORLD-CLASS
HYDROTHERMAL BASE METAL SULFIDE OREBODY AT NAVAN, IRELAND

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Abstract

We report sulfur and lead isotope analyses of mine concentrates from Navan, the largest zinc deposit in Ireland. These samples, each representing up to a million tonnes of ore, show very limited isotopic variation, with mean $\delta^{34}\text{S} = -13.6 \pm 2$ per mil ($n = 20$), and galena concentrate mean $^{206}\text{Pb}/^{204}\text{Pb} = 18.19 \pm 0.03$ ($n = 7$). Calculations suggest ≈ 90 percent of the Navan sulfides were derived through bacteriogenic reduction of Mississippian seawater sulfate, whereas metals were acquired from a local, orogenic crustal source beneath the orebody. Enhanced bacterial activity was fundamental to ore deposition at Navan: no bacteria, no giant ore deposit.