# Could organic rich, black shales be a source for MVT deposits?

**Bryan Bottoms**[1]

[1]University of Arkansas

## ABSTRACT

Organic rich, black shales are known to act as sources of hydrocarbons, but they may also act as a source of Mississippi Valley Type (MVT) Pb/Zn ore deposits. MVT deposits are often found in close proximity to hydrocarbons and their presence may in fact be related. MVT deposits occur along the peripheries of sedimentary basins and are typically hosted within carbonate rocks. Very dense, chloride rich, basinal brines, known as “oil¬field” brines due to their occurrence with oil in many basins, carry the mobilized metals. The brines responsible for creating the ores are sourced from the adjacent sedimentary basin, are of low temperature (around 60ºC – 150ºC), and may flow hundreds of km through the basin before precipitating the ores. The hydrocarbons are often concentrated in different areas of the host basins than the ores; however, ores in some deposits are characterized by hydrocarbon and brine fluid inclusions. Fluids expelled from the shales, both hydrocarbons and mineralizing fluids, are likely traveling along the same pathways, perhaps even simultaneously.

MVT ores from the Tri-State (TS) and Northern Arkansas (NA) mining district are of Permian age and are hosted in platform carbonates ranging from Ordovician and Mississippian in age for the NA district and Mississippian in age for the TS district. Sphalerite (ZnS) ores and black shales from the late Devonian age Chattanooga Shale and Mississippian age Fayetteville Shale were collected from strategic locations within and nearby the TS and NA mining districts. Mineral separates and whole rock shale samples were analyzed for their trace element concentrations and Pb isotopic ratios in order to compare and contrast them and evaluate the source of the metals. The analyses were conducted on a Thermo Scientific ICAP Q ICPMS for their elemental concentrations and a high resolution Nu Plasma MCICPMS for their Pb isotope ratios at the University of Arkansas.

Current results indicate that there is a genetic link between the organic rich, black shales and nearby MVT deposits. Organic rich, black shales may represent the source of the metals due to their anomalously high metal content and radioactive nature, in addition to the fact that shales have the most connate fluid associated with sediments before compaction. The mineralizing fluids may have been expelled from the shales in the Arkoma Basin during the Ouachita orogeny.