

Diversity of Zinc-Lead Metallogeny – Implications for Targeting and Discovery

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From the minefield of diverse zinc-lead metallogenic models, riddled with alternative classifications and nomenclature, it is possible to draw out unifying themes relevant to targeting, future discovery opportunities, and optimum economic returns. In fact, VHMS, SHMS, BHT, Irish-type and MVT deposits share important attributes and targeting criteria. The most important shared attribute is the uniqueness of each district, and the need to build district-scale targeting models.

VHMS deposits contribute a substantial proportion of global Zn-Pb production, and are typically polymetallic with high-value ore, but have been of declining production importance. In Australia and globally, SHMS deposits are the biggest producers from the biggest deposits and host the greatest in situ resources. BHT includes the largest deposit, but these deposits are rare. Irish-type deposits host substantial resources, but confusion over genetic models has hampered target understanding. MVT includes the single largest Zn-Pb district, but mineralisation tends to be low grade and production from this type has been of declining significance. Manto and skarn deposits are of greater importance than is often realised, and almost solely account for Peru being the second or third largest Zn and Pb producer. A number of unusual Zn-Pb deposit types also host significant resources, including ‘hybrid’ MVT deposits with features of SHMS and epithermal systems, as well as Zn-silicate deposits.

There has been a dearth of significant greenfields Zn discoveries in the last 10-15 years, with most new resource and production from extensions or satellites to existing deposits or operations. Many of the larger undeveloped resources are still in the ground for a good reason, including difficult metallurgy or remoteness. Most miners and forecasters predict a Zn gap opening in the next 5 years. Where are the new discoveries going to be made to fill this gap and which deposit type presents best opportunities? What targeting and technological breakthroughs can help break the discovery drought?

The relatively recent spate of geophysical VHMS discoveries in Canada points in one direction. Integrated play-scale targeting of SHMS and Irish-type is another approach. Recognition of potential in largely or completely unrecognised target belts, which may be in frontier regions, is a neglected approach which perhaps ultimately can yield greatest returns. But effective geological observation and understanding leading to development of empirical targeting models unique to each belt and district is essential if the chances of discovery are to be optimised.