A link has been made between the amount of gold and arsenic in pyrite. Reich et al. (2005) found that the maximum amount of gold that can be contained in the pyrite structure can be defined by a maximum solubility curve on a gold vs. arsenic plot where gold in pyrite with concentrations above the curve must be held as nanoparticles. However, it is not clear whether the gold/arsenic ratios that plot below the curve are held within the pyrite structure or as nano-inclusions that are not in high enough abundance to make the analyses go above the solubility curve. Laser ablation time-resolved output graphs can be used to distinguish between structurally held gold and micro-inclusions because if there are distinct peaks, it can be concluded the gold is present as nano-inclusions. However, if the counts are relatively consistent, it is often interpreted that the gold is held within the pyrite structure, although it has been noted that it is possible that they are in uniformly distributed nano-inclusions.

What Ehrig et al. (2023, this issue) have achieved is to utilize transmission electron microscopy (TEM) and electron backscatter diffraction (EBSD) to investigate how gold was held in pyrite that had LA-ICP-MS spot analyses with gold concentrations under the gold solubility line and with relatively flat counts of gold on laser ablation time-resolved output graphs (i.e., a situation where gold would often have been interpreted to be held within the pyrite structure; Ehrig et al. 2023). Importantly, they present data from both the LA-ICP-MS scale and the TEM scale so it can be understood how the latter data can inform the interpretation of the former data. What they found was that indeed gold is held within a variety of nano-inclusions, including electrum, tellurides, and Bi and Pb minerals. This shows that conclusions cannot be made on how gold is held within pyrite if it plots under the gold solubility line. This is important as pyrite trace element content is not held within the pyrite structure. The study by Ehrig et al. (2023, this issue) shows, using a combination of LA-ICP-MS spot analyses of gold in pyrite, transmission electron microscopy, and electron backscatter diffraction that this is not necessarily the case. Furthermore, they use these same techniques to identify how trace elements, including gold, are remobilized in pyrite during deformation and metamorphism.

**Keywords:** TEM, gold, arsenic, nanoparticles

In conclusion, this paper gives important empirical observations demonstrating that despite LA-ICP-MS analyses below the gold solubility line and flat gold laser ablation output graphs, the gold is held within nano-inclusions, and it is not held within the pyrite structure. This shows that while analyses that plot above the curve can be interpreted to be free gold inclusions, it cannot be known that analyses that plot below the curve show structurally bound gold. Furthermore, the paper provides interesting information regarding how gold is remobilized during deformation.

**References cited**

