Mineral textures and fluid inclusion characteristics of ore samples from the Guanajuato district, Mexico

D. MONCADA* AND R.J. BODNAR

Dept. of Geosciences, Virginia Tech, Blacksburg, VA 24061 USA (*correspondence: moncada@vt.edu, rjb@vt.edu)

Successful exploration for mineral deposits requires tools that the explorationist can use to distinguish between targets with high potential for mineralization and those with lower economic potential. In this study, we describe a technique based on petrographic and fluid inclusion characteristics that may be applied in exploration for precious metal deposits to identify areas of high-grade mineralization.

The Guanajuato mining district in Mexico is one of the largest silver producing districts in the world with continuous mining activity for nearly 500 years. Ore shoots in the district are localized along three major northwest trending vein systems, the La Luz, the Veta Madre and the Vetas de la Sierra. Mineralization in the district shows much variability between and within individual deposits, from precious metal-rich to more base-metal-rich zones, and from gold-rich to silver-rich zones. Ore textures also vary and include void space that formed during multiple fissuring events, banded quartz veins, massive quartz veins and stockworks. More than 1, 200 samples representing all the different mineralization styles were collected from all three vein systems in the Guanajuato mining district, and the mineral textures and fluid inclusion characteristics of each sample have been defined. In addition, each sample was assayed for Au, Ag, Cu, Pb, Zn, As and Sb.

Samples from the Guanajuato district show a wide range in silica textures. Some of these textures, including colloform texture, plumose texture and jigsaw texture, are indicative of rapid precipitation, such as occurs when fluids boil. Other mineral phases, including illite, rhombic adularia and bladed calcite are also indicative of rapid growth in a hydrothermal system and are characteristic of boiling systems. Because boiling is an effective mechanism for precipitating gold and silver from hydrothermal fluids, the presence of mineral textures indicative of boiling is a desirable feature in exploration. In many samples, textural evidence for boiling is supported by coexisting liquid-rich and vapor-rich fluid inclusions, or Fluid Inclusion Assemblages consisting of only vapor-rich inclusions, suggesting ‘flashing’ of the hydrothermal fluids. Textural and fluid inclusion evidence for boiling has been observed in the deepest levels of the Guanajuato mining district, suggesting that additional precious metal resources may occur beneath these levels.

Sulfide mineralogy of West Greenland kimberlitic mantle xenoliths

SISIR K. MONDAL[1]*, STEFAN BERNSTEIN[2] AND MINIK T. ROSING[2]

[1]Department of Geological Sciences, Jadavpur University, Kolkata-700032, India (*correspondence: sisir.mondal@gmail.com)

[2]Natural History Museum of Denmark, University of Copenhagen, 1350 Copenhagen, Denmark (sb@avannaa.com, Minik@snm.ku.dk)

Sulfide minerals control the platinum group element (PGE) budget of mantle rocks along with PGE behaviour during melting and thus trace the Earth’s differentiation processes. We have conducted mineralogical study of the sulfide assemblages of mantle xenoliths sampled from two West Greenland kimberlites dykes of presumed Neoproterozoic age. One dyke from the Sarfartoq area, is situated in 2.8 Ga continental crust, and part of the ca. 1.8 Ga Nagsoqtoqidian mobile belt. The second kimberlite dyke comes from the Aasivik terrain which represent early Archaean, 3.5 to 3.7 Ga crust. The Sarfartoq- and Aasivik-dykes can therefore be classified as Proton and Archon, respectively. The xenoliths from the Sarfartoq kimberlite dyke are relatively fresh but commonly contain pockets of fine-grained magnetite, mica and hydrothermally altered silicates interpreted to represent melts invaded from the kimberlitic host. The Sarfartoq-dyke xenoliths are garnet-lherzolite (olivine Fo 86.8-91.1), garnet-dunite (olivine Fo 90.1-91.2), spinel-dunite (olivine Fo 91.4-93.0) and dunite (olivine Fo 89.2-92.5). Sulfide minerals are present as rounded blobs mostly within olivine and rarely within garnet and clinopyroxene. Minor amount of interstitial sulfide is also present. Both types commonly occur in a single sample. Blobs are dominated by pentlandite with minor chalcopyrite and pyrrhotite and veined by late generated magnetite. The xenoliths from the Aasivik kimberlite dyke are nearly all extensively altered and appear to be mostly dunite (olivine Fo 87.8-92.5). Only relicts of olivine grains are present, and these contain blobs of sulfides as inclusions. Our study suggests that the sulfide was initially monosulfide solid solution, re-equilibrated at low temperature.