Evidence of Sulfide Melting in Pegmatite Veins Containing Precious and Base Metals in the Paleoproterozoic Basement of the Tandilia System, Buenos Aires, Argentina

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Igneous and metamorphic rocks within the Buenos Aires Complex (Tandilia System basement) are intruded by a set of pegmatite veins composed of quartz, plagioclase, tourmaline, garnet, biotite, muscovite and black and white microcline containing sulfide inclusions. These bodies are derived from the fractionated melt evolution of leucosomes and leucogranites formed during an amphibolite-granulite facies metamorphic event. The aim of this study is to describe the first evidence of sulfide melting rich in precious and base metals in the Tandilia System basement and its comparison with other world examples. Examination under chalcopetrographic and electronic microscopes (SEM-EDS) revealed that microclines contain multiphase and monomineralic sulfide inclusions along with isolated concentrations of sulfosalts and other Low-Melting-Point Chalcophile Elements (LMCEs), while quartz contains sulfide inclusions trails. Based on the theoretical formula reconstruction, multiphase inclusions contain daughter mineral phases of chalcopyrite-galena-molybdenite-pyrite-bismuthinite, chalcopyrite-galena-molybdenite-pyrite, argentite-pyrargyrite and stibnite-pyrite-sphalerite. Furthermore, monomineralic sulfide inclusions of galena, sphalerite, argentite, pyrite and molybdenite were found in microclines. The LMCEs are mostly distributed in concentrated pockets of sulfides and sulfosalts, that have irregular shapes, comprising arsenopyrite, stibnite, miargyrite, pyrargyrite and gold. Also, LMCEs such as antimony, arsenic, silver, gold and bismuth are disseminated in the microcline crystals. These observations are similar to those found in metamorphized ore bodies such as Broken Hill, Australia; Rajpura-Dariba, India and Aggeneys, South Africa. In these cases, the presence of multiphase and monomineralic inclusions of sulfides, as well as isolated concentration of sulfosalts and other LMCEs were interpreted as the result of partial melting of sulfide bodies rich in base and precious metals during the metamorphic peak. In this sense, the information provided in this research is relevant for the definition of future mineral deposits in Proterozoic igneous-metamorphic terranes and for the improvement of genetic modeling.