STABLE ISOTOPE STUDIES OF THE ULSAN Fe-W SKARN DEPOSIT, KOREA

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The Ulsan Fe-W deposit occurred as calcic skarn and vein deposits near Tertiary epizonal, granite stock. The sequential metasomatic processes display a progression from massive skarn replacement of marble to more diffuse or disseminated or veinlike replacement of earlier massive anhydrous assemblages. In particular, the calcite megacrystal zone at outermost margin of the massive skarn or the magnetite ore occurs along reaction fronts replacing the surrounding marble. In the prograde skarn (stage II) the hydrothermal fluid responsible for Fe mineralization is characterized by low CO2 fugacity (XCO2 =0.1) well supported by the absence of a CO2-rich phase in the fluid inclusions at a temperature ranges of 350¡Æ to 450¡ÆC with high salinity. Moreover, the calculated isotopic values of the hydrothermal fluids are strongly depleted in d18O (6.75¢) and d13C (-7.67¢), implying that these hypersaline solutions are a magmatic-dominant fluid derived from melts emplaced at high crustal levels. The isotopic covariations of marble and the skarn calcite during this stage can be explained as a progressively increasing water/rock ratio by a hydrothermal fluid in an open system. In addition, the magmatic hydrothermal fluid is inferred to have moved vertically and horizontally through the marble before no mixing with meteoric water. The hydrous silicates and tungsten-polymetallic mineralizations are formed from the less saline, lower temperature ore-forming fluids by mixing with meteoric water during retrograde skarn and vein stages. The temperature decrease from 340¡Æ to 135¡ÆC obtained from the isotopic analyses of siderite in siderite-quartz vein reflects an important change in the hydrology of the hydrothermal system.