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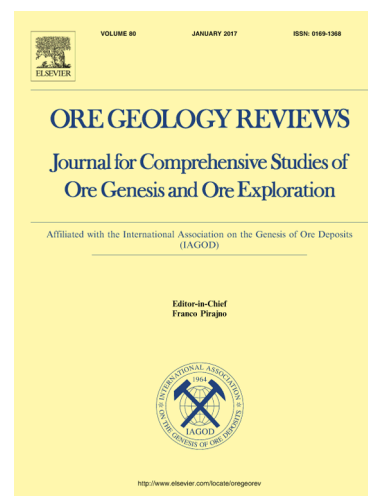
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1 Chemical responses to hydraulic fracturing and wolframite
2 precipitation in the vein-type tungsten deposits of southern China

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11 **Abstract:** Wolframite is the main ore mineral in the vein-type tungsten
12 deposits of southern China. Much progress has been made on the
13 characteristics of the mineralizing fluids, but the mechanisms of wolframite
14 precipitation remain poorly understood. Hydraulic fracturing driven by high-
15 pressure fluids is a common mechanical process during magmatic-
16 hydrothermal transition, but it is uncertain whether and how this mechanical
17 process may affect chemical equilibrium and cause wolframite precipitation.
18 This paper examines how a hydraulic fracturing process affects solubility of
19 tungsten in CO₂-saturated NaCl solutions using a hydro-mechanical numerical
20 model coupled with a multi-component thermodynamic model. The
21 thermodynamic model presented here is in the system of Fe-W-Cl-Na-C-O-H.
22 The modeling results indicate that fluid pressure exerts a significant influence
23 on chemical equilibrium where CO₂ solubility in NaCl solutions decreases with
24 decreasing fluid pressure and pH increases with decreasing fluid pressure. An
25 increase in pH reduces the concentrations of the dominant iron-bearing
26 species (FeCl₂⁰) and the dominant tungsten-bearing species (HWO₄⁻) in fluids.
27 Tungsten solubility in fluids reaches tens of ppm. Over ten fluctuations of fluid
28 pressure are identified in the numerical experiments of hydraulic fracturing.
29 These pressure fluctuations cause a decrease in solubility of tungsten by over
30 30% of the maximum solubility. Repeated drops of fluid pressure during
31 hydraulic fracturing processes cause CO₂ loss and could be efficient
32 processes for precipitating wolframite from mineralizing fluids. These findings
33 may also offer an insight into the precipitation mechanisms of other metals
34 from CO₂-bearing hydrothermal fluids.

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