High Pressure Leaching of Mongolian MoS_2- Concentrate

Aims:

- Conversion efficiency of MoS_2 to MoO_3
- Investigation of reaction kinetics
- Intensifying of high pressure leaching of Mo-concentrate

Material:

Molybdenit (MoS_2)- concentrate from Erdenetiin ovoo/Mongolia

Elemental composition of the MoS_2-concentrate in wt. %

Mo	Cu	S	Fe	Re	SiO2	moisture + oil
48,1	3,96	32	4,04	0,03	1,48	10

Mineralogical analysis of the MoS_2-concentrate in wt. %

MoS2	CuFeS2	Cu2S	CuS	FeS
83,4	1,17	0,38	0,26	3,34

Particle size distribution

particle size [mm]	%
> 0,16	0,25
> 0,10	0,87
> 0,08	2,75
0,044	18,69
< 0,044	77,45

Test equipment:

- 2 dm^3, Autoclav Engineers, USA
- temperature control system ± 1°C
- electrical heating mantle, water cooling system
- fast acid injection device

- titanium vessel volume: V_{vessel} = 1 dm^3
- max. permissible pressure: p_{max} = 100 bar
- max. temperature: T = 300 °C
- max. stirring speed: n = 3000 rpm
- online sampling

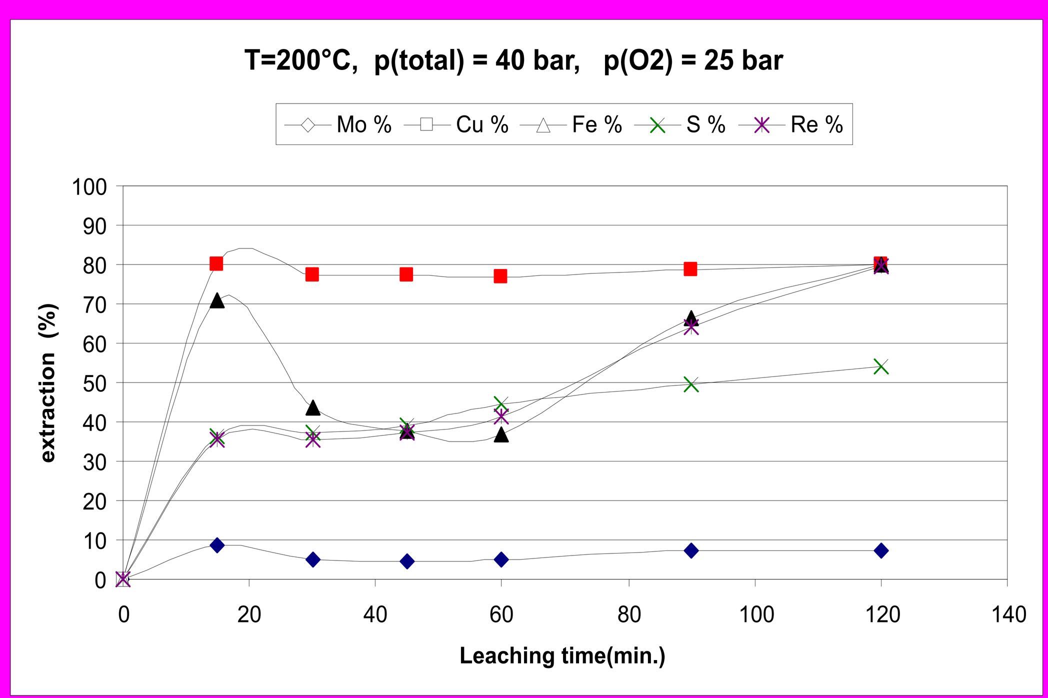
Experimental parameters:

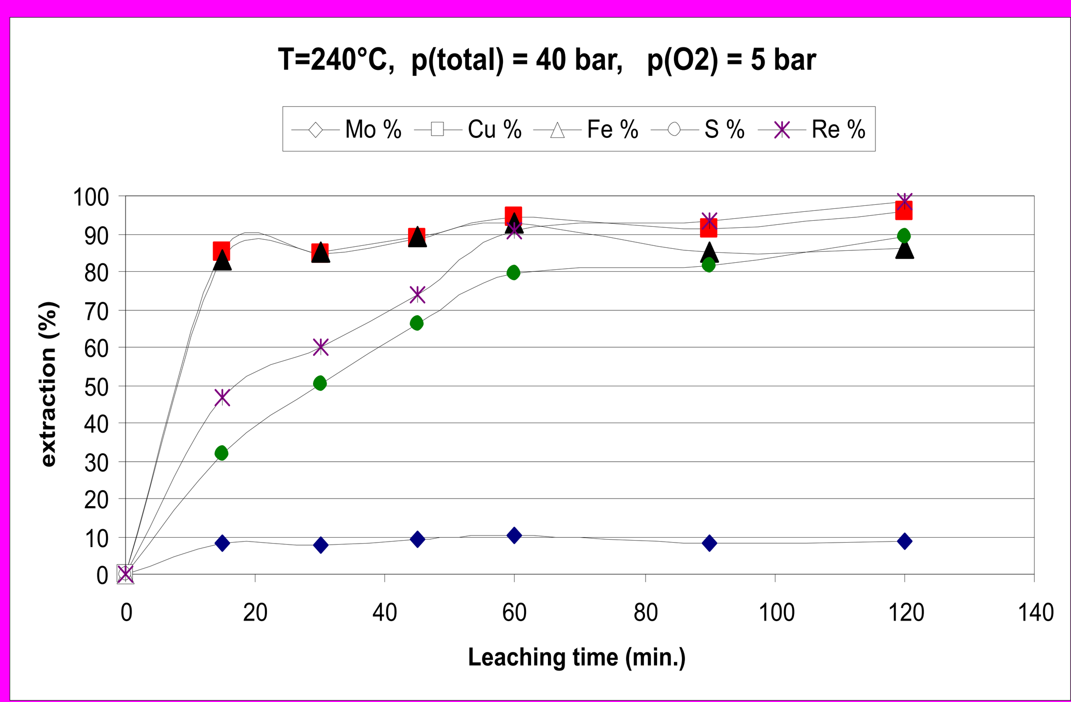
sample weight: 100 g Mo-concentrate
ratio of mass between H_2SO_4 and MoS_2: a/o = 0,2
Stirring speed: n = 1000 rpm
leaching tempereture: 200°C, 220°C and 240°C
leaching time (interval for sampling): 15 min., 30 min., 45 min., 60 min., 90 min., 120 min.
oxygen partial pressure: 5 bar, 15 bar and 25 bar
total pressure: 30 bar, 40 bar and 50 bar

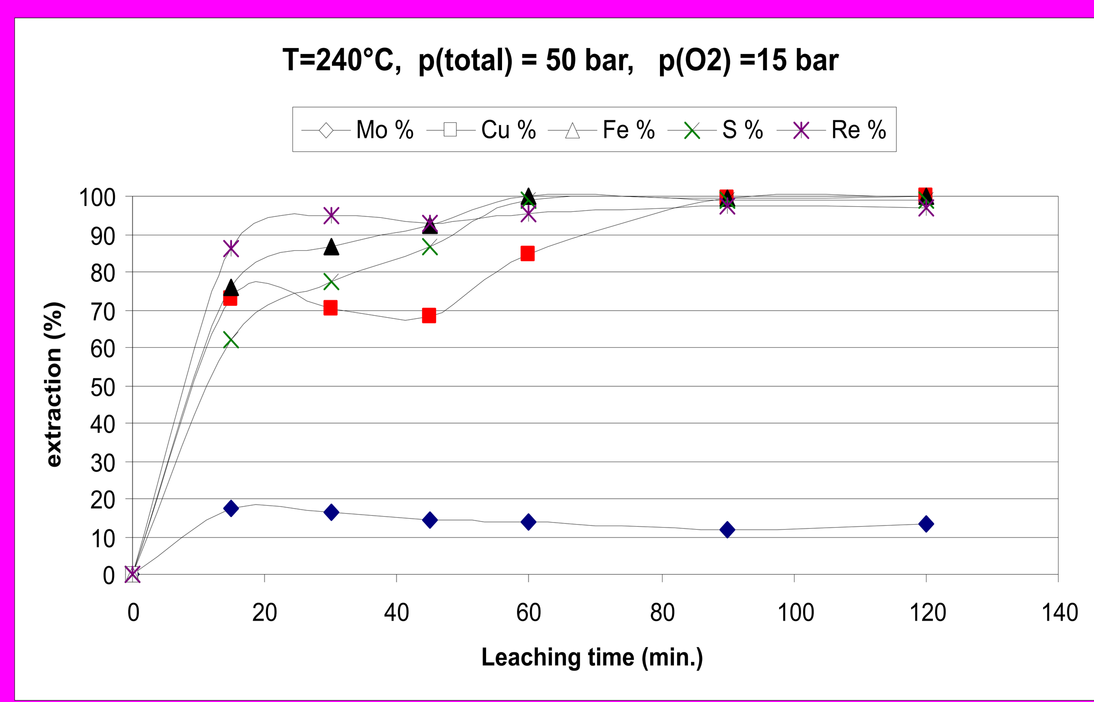
Main leaching chemistry

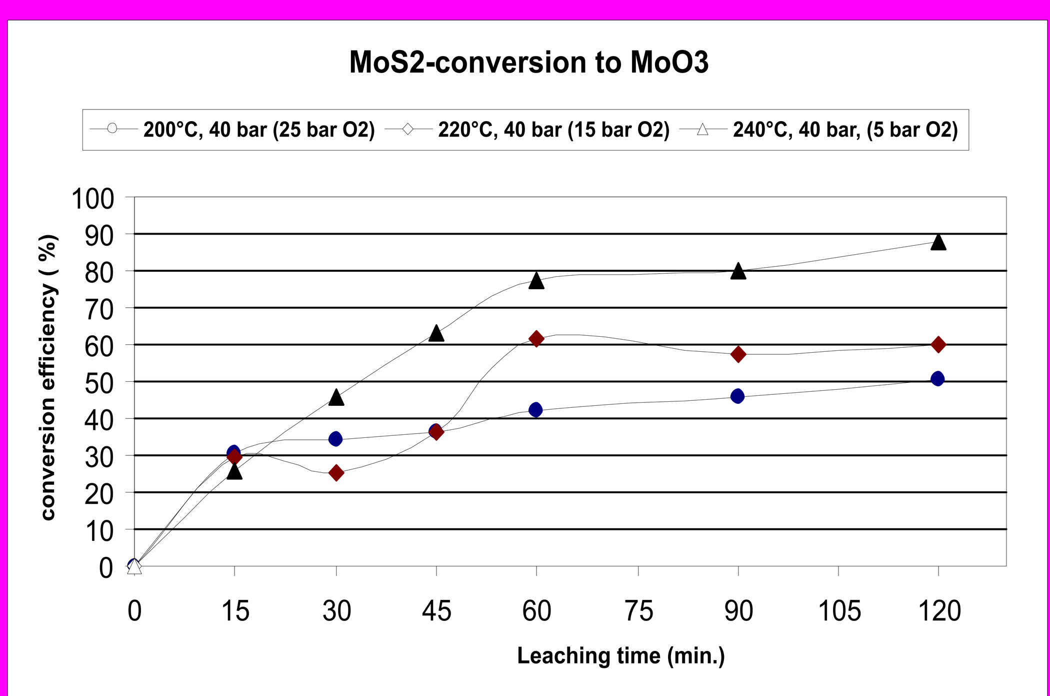
$$MoS_2(s)+9/2O_2(g)+2H_2O(l)\Leftrightarrow MoO_3(s)+2H_2SO_4(aq)$$
$$CuFeS_2(s)+H_2SO_4(aq)+1/2O_2(g)\Leftrightarrow CuS(s)+FeSO_4(aq)+S^0+H_2O(l)$$
$$Cu_2S(s)+H_2SO_4(aq)+5/2O_2(g)\Leftrightarrow 2CuSO_4(aq)+H_2O(l)$$
$$CuS(s)+2O_2(g)\Leftrightarrow CuSO_4(aq)$$
$$FeS_2(s)+7/2O_2(g)+H_2O(l)\Leftrightarrow FeSO_4(aq)+H_2SO_4(aq)$$
$$2S^0+3O_2(g)+2H_2O(l)\Leftrightarrow 2H_2SO_4(aq)$$

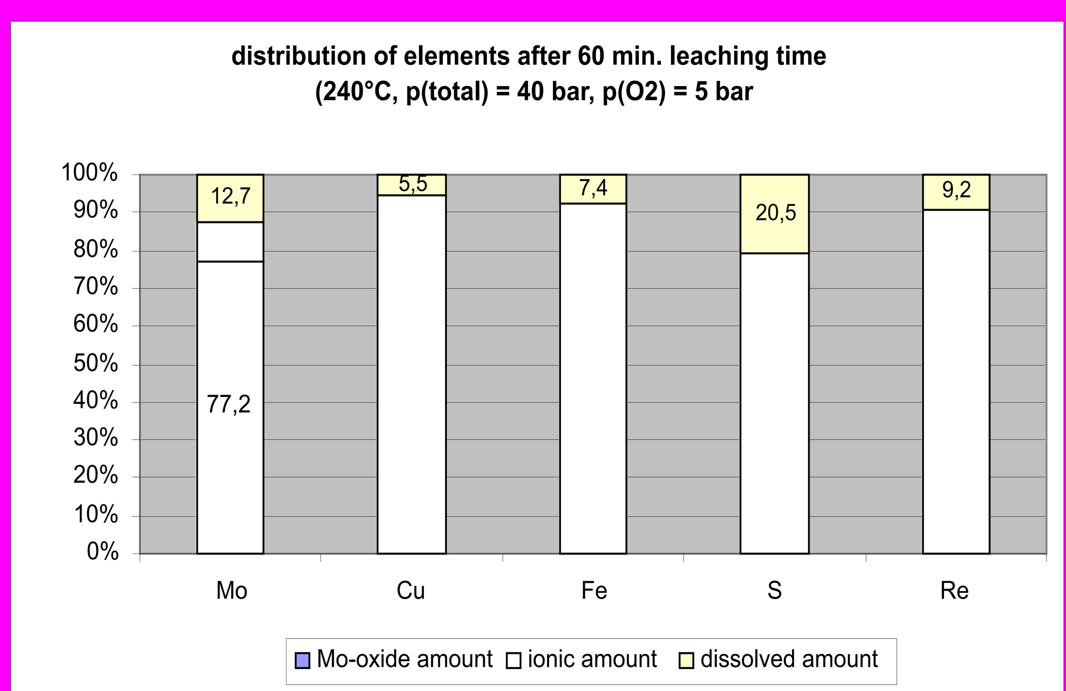
Results:





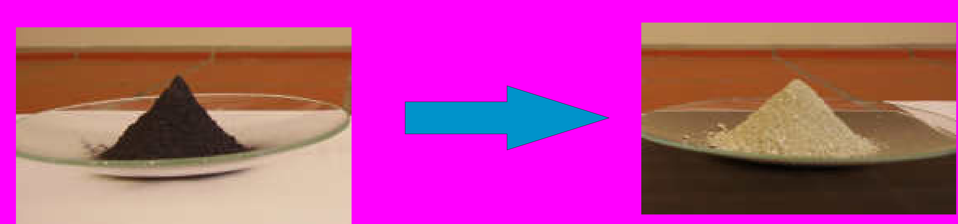






Solution samples (240°C, p(total) = 40 bar, p(O) = 5 bar)

15 min. 30 min. 45 min. 60 min. 90 min. 120 min.



Conclusions:

- Increasing of conversion efficiency of MoS_2 to MoO_3 with increasing leaching temperaure, time and partial pressure of oxygen
- Dissolved molybdenum is constant during the leaching.
- Accompanying elements are solved quick and almost completely.

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