u saradnji sa:

Fakultetom tehničkih nauka u Kosovskoj Mitrovici,
Tehničkim fakultetom u Boru i
Associated Phase Diagram and Thermodynamics Committee
(Poland, Czech Republic, Hungary, Bulgaria, Slovenia, Serbia,
Montenegro, Romania, Croatia, Bosnia and Herzegovina)

sa međunarodnim učešćem

ZBORNIK IZVODA RADOVA

Kosovska Mitrovica,
19-20. jun 2017. god.

Osmi simpozijum o termodinamici i faznim dijagramima

Izdavač:
Fakultet Tehničkih nauka
Kneza Miloša br.7, 38220 Kosovska Mitrovica
Tel/Fax: (+381 28) 425-320 / 425-322
office@ftn.pr.ac.rs

Za izdavača:
Dekan,
Prof. dr Nebojša Arsić

Urednik:
Prof. dr Duško Minić

Kompjuterska obrada:
Asistent Milica Tomović

Tiraž: 100 primeraka
Štampa:
ISBN
CIP

Simpozijum je finansijski podržan od strane
Ministrastva obrazovanja, nauke i
tehnološkog razvoja Republike Srbije

Osmi simpozijum o termodinamici i faznim dijagramima

Naučni odbor

Prof. dr D. Minić, Srbija, predsednik,
Prof. dr D. Manasijević, Srbija
Prof. dr Y. Du, Kina
Prof. dr G. Kaptay, Mađarska
Prof. dr J. Vreštal, Češka Republika
Prof. dr I. Katayama, Japan
Prof. dr G.P. Vassilev, Bugarska
Prof. dr J. Medved, Slovenija
Prof. dr J. Lamut, Slovenija
Prof. dr A. Udovsky, Rusija
Doc. dr T. Holjevac Grgurić, Hrvatska
Prof. dr D. Blečić, Crna Gora
Prof. dr D. Ćubela, BiH
Dr V. Ćosović, Srbija
Dr N. Talijan, Srbija
Prof. dr N. Štrbac, Srbija
Dr A. Kostov, Srbija
Dr M. Sokić, Srbija
Dr B. Marković, Srbija

Organizacioni odbor

Prof. dr D. Minić, predsednik
Prof. dr D. Manasijević,
Doc. dr Lj. Balanović,
Doc. dr. M. Premović,

Sadržaj:

Plenarno predavanje

Izvodi radova:

Mechanism of polymetallic concentrate leaching with sulfuric acid and hydrogen peroxide solution

Miroslav Sokić[1], Branislav Marković[1], Nada Štrbac[2], Željko Kamberović[3], Vaso Manojlović[1], Vladislav Matković[1], Mladen Bugarčić[1]

[1]*Institute for Technology of Nuclear and Other Mineral Raw Material, Belgrade, Serbia*
[2]*University in Belgrade, Technical Faculty in Bor, Bor*
[3]*University in Belgrade, Faculty of Technology and Metallurgy, Belgrade*

Abstract

The determination of mechanism of the polymetallic concentrate leaching with sulfuric acid and hydrogen peroxide was done based on the characterization of the starting concentrate and leach residues. The application of XRD and thermal analysis on the leaching mechanism determination was done. The phase content of concentrate and leach residues were determined by X-ray analysis using diffractometer PHILIPS PW-1710. DTA and TG analysis were performed in air atmosphere up to 1173 K on NETZSH, model 409 EP, device.

The polymetallic concentrate, used in experiments, has the following chemical composition (in wt. %): Cu-8.92, Zn-8.79; Pb-12.66, Fe-19.80 and S-21.4. X-ray phase analysis of the concentrate reveals that the sample contains chalcopyrite, sphalerite, galena pyrhotite and quartz (Fig. a). On Fig. b the DTA and TG curves of polymetallic concentrate are shown. Curves include two parts: first, a low temperature, which correspond to the sulfides oxidation (the mass increase on the TG, and exothermic peaks on the DTA); and second which correspond to the dissociation of sulphates and oxysulphates (the mass loss on the TG, and endothermic peaks on the DTA).

The phases identified in the leach residue by XRD were elemental sulphur, anglesite, chalcopyrite, sphalerite, galena pyrhotite and quartz (Fig. c), which confirms that the elemental sulphur is formed during leaching. In Fig. d the TG-DTA curve of the leach residue are shown. On DTA curve on the temperature of 118 ºC, the endothermic peak as a result of elemental sulfur melting is clearly visible. Then, in the range of 250-350 ºC, weight loss as a consequence of the oxidation of sulfur to SO_2 gas occurs. The loss of mass due to combustion of sulfur on Fig. d is smaller than the sulfide sulfur which is oxidized during the leaching process, which indicates that the sulfur from sulfides is oxidised both to the sulfate and to the elemental form. The mass increase followed by exothermic effects in the range of 400-700 ºC is a result of the oxidation of unleached sulphides in the solid residues. At temperatures above 720 °C weight loss occurs as a result of dissociation of sulphate and oxysulphates of lead, zinc, copper and iron with endothermic peaks on the DTA curve. XRD and DTA/TG studies have contributed in determining the mechanism of polymetallic concentrate leaching process in the system H_2SO_4-H_2O_2-H_2O:

$CuFeS_2 + 5/2H_2O_2 + 5/2H_2SO_4 = CuSO_4 + 1/2Fe_2(SO_4)_3 + 2S^0 + 5H_2O$ (1)

$CuFeS_2 + 17/2H_2O_2 + 1/2H_2SO_4 = CuSO_4 + 1/2Fe_2(SO_4)_3 + 9H_2O$ (2)

$ZnS + H_2O_2 + H_2SO_4 = ZnSO_4 + S^0 + 2H_2O$ (3)

$ZnS + 4H_2O_2 = ZnSO_4 + 4H_2O$ (4)

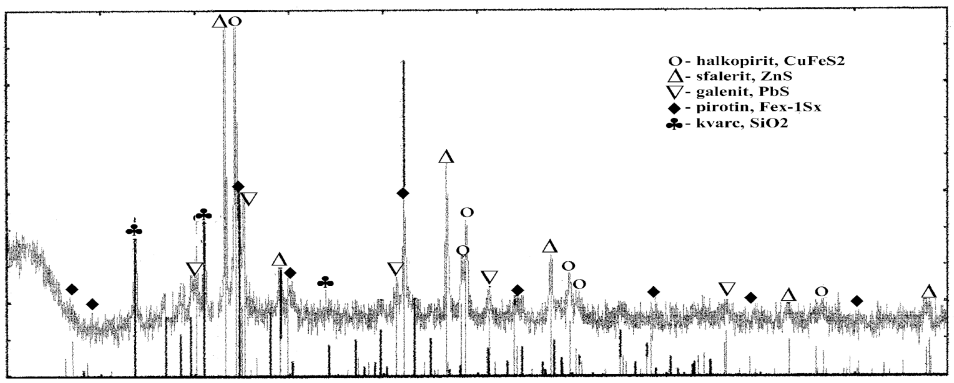
$PbS + H_2O_2 + H_2SO_4 = PbSO_4 + S^0 + 2H_2O$ (5)

$PbS + 4H_2O_2 = PbSO_4 + 4H_2O$ (6)

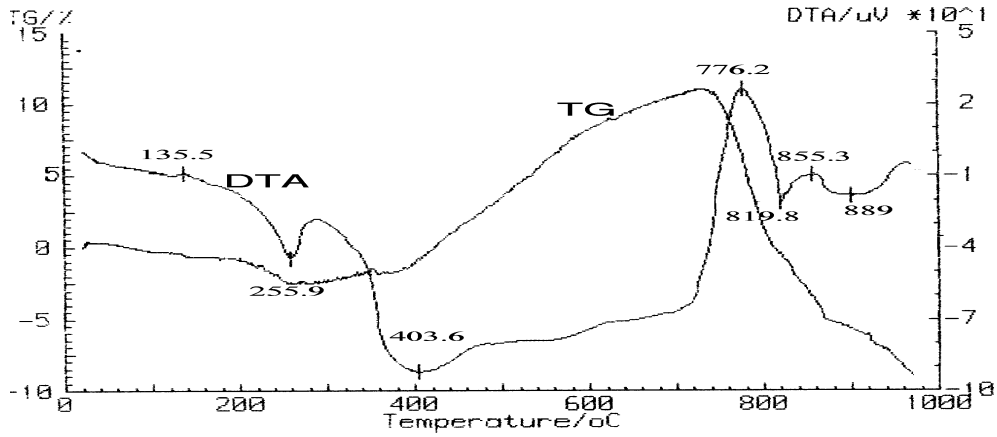
Acknowledgements

The authors wish to acknowledge the financial support from the Ministry of Education, Science and Technological Development of the Republic of Serbia through the project TR34023.

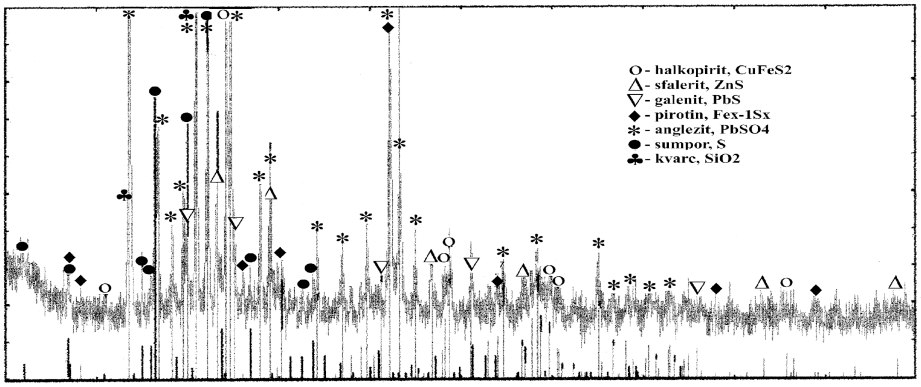
Graphical abstract:



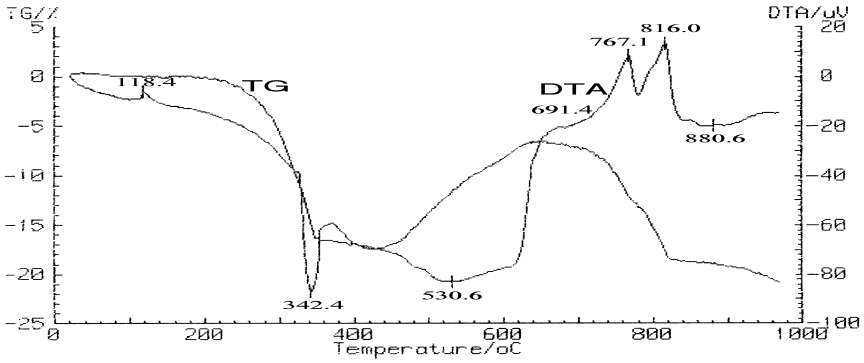
a)



b)



c)



d)

a) XRD analysis of the polymetallic concentrate; b) DTA/TG analysis of the polymetallic concentrate; c) XRD analysis of the leach residue: T=35°C, t=240 min; d) DTA/TG analysis of leach residue: T=35°C, t=240 min.

CIP – Категоризација у публикацији Народна библиотека Србије, Београд

SIMPOZIJUM o termodinamici i faznim dijagramima sa međunarodnim učešćem (8 ; 2017 ; Kosovska Mitrovica)

Zbornik izvoda radova / Osmi simpozijum o termodinamici i faznim dijagramima sa međunarodnim učešćem, Kosovska Mitrovica, 19-20. jun 2017. ; [organizatori] Komitet za termodinamiku i fazne dijagrame Srbije ... [et al.] ; [urednik Duško Minić]. - Kosovska Mitrovica : Fakultet tehničkih nauka, 2017 (Vrnjačka Banja : SaTCIP). - 95 str. : ilustr. ; 24 cm

Radovi na srp. i engl. jeziku. - Tiraž 100. - Bibliografija uz većinu radova.

ISBN 978-86-80893-71-6
669.017.11(048)
536.76(048)
544.344.9.015.3(048)

COBISS.SR-ID 237630220