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Belgrade, Serbia, June 17-19, 2015

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THE PRINCIPLES AND EXAMPLES OF KINETIC PERFORMANCE FOR DOMESTIC LEAD AND ZINC ORES

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Abstract.Selective galena and sphalerite flotation in domestic Macedonian concentrators. The examples of kinetic characteristcs in Sasa, Zletovo and Toranica. Special view of Matlab presentation of kinetic performance for different ore mineralization at the different mines. Flotation regime with impact for the metal recovery for lead and zinc. Comparation and discussion for obtained results for mentioned three mines.

Keywords: Selective flotation, Matlab, Kinetic, Sasa, Toranica

Section 5

INTRODUCTION

In the possible and existing equations for flotation kinetic the assumption is such that velocity coefficient for anyones sulphide minerals (for example chalcopyrite or galena) is the constant k. The huge number of investigators, as A. Gupta, D.S. Juan had calculated the number of group models (*grouped tests for flotation*) or cumulative flotation from first order considering the following models:

- Clasical kinetic model, $I=I_o[1-e^{-kt}]$
- Klimpel kinetic model, $I=I_o[1-\frac{1}{kt}(1-e^{-kt})]$
- Kelsal kinetic model, $I = (i_o-\phi)(1-e^{-kft}) + (1-e^{-kst})$
- Modified Kelsal kinetic model – Gama model from Loveday, Innou, $I=I_o(1-(\frac{k}{k+t})^P)$

The mentioned kinetic models are appropriate for presentation of the main flotation charascteristic, *the flotation kinetic*, very important for everyone project solution or assumption for good and sure flotation performance. According to the existing or previous kinetic investigations for kinetic flotation (Clasical kinetic model) for different sulphide minerals, the above mentioned models and constant k for lead or zinc minerals will have the following equation (galena and sphalerite):

$$I_{PbS} = I_o [1-e^{-kt}] = 90.25 [1 - e^{-1.025xt}]$$

$$I_{ZnS} = I_o [1-e^{-kt}] = 83.25 [1 - e^{-1.025xt}]$$

According to the existing or previous kinetic investigations for kinetic flotation (Clasical kinetic model) for different minerals, the above mentioned models and constant k for lead and zinc minerals will have the following equation:

$$I = I_o [1-e^{-kt}] = 85.5 [1 - e^{-0.56xt}]$$

According to the existing or previous kinetic investigations for kinetic flotation (Clasical kinetic model) for different sulphide minerals, the above mentioned models and constant k for lead or zinc mineral will have the following equation:

$$I_{PbS} = I_o [1-e^{-kt}] = 90.2 [1 - e^{-0.61xt}]$$

$$I_{ZnS} = I_o [1-e^{-kt}] = 80.2 [1 - e^{-0.61xt}]$$

Kinetic flotation modeling of chalcopyrite using software tools

The applicable software packete for kinetic flotation modeling in **MATLAB®(R) GUI**, will be shown for concrete examples for copper minerals flotation enabling appropriate tabular or graphic presentation for Clasical kinetic model (I. Brezani, F. Zelenek), determining the constant k in the function of the time frequency of the useful reagent addition.

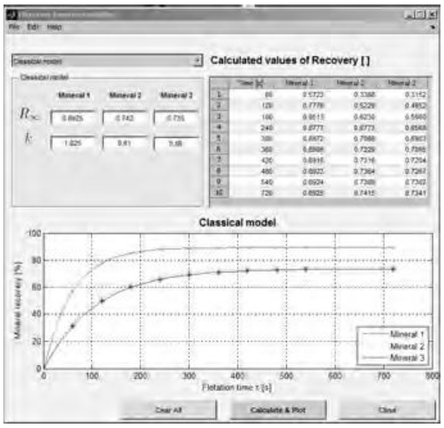


Figure 1. Kinetic presentation by Matlab

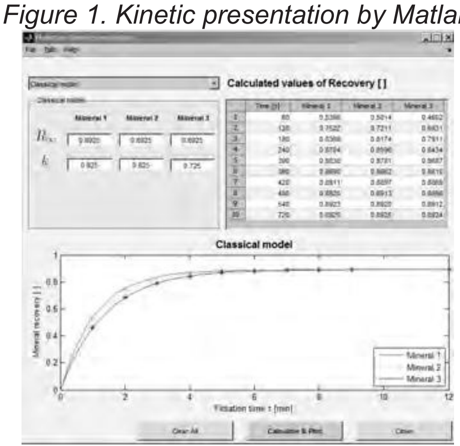
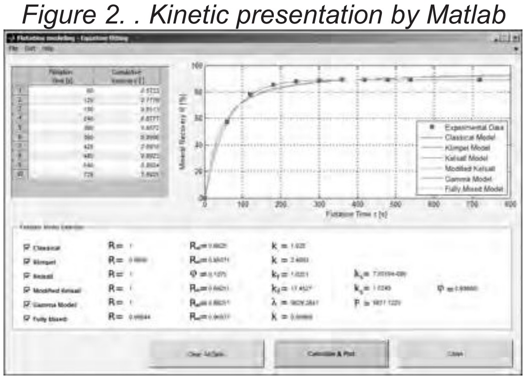


Figure 2. . Kinetic presentation by Matlab



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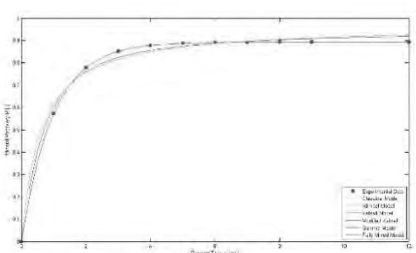

Figure 4. . Kinetic presentation by Matlab

Comparison of the kinetic models (Classical, Klimpel and Fully mixed model) for constant *κ* and flotation time

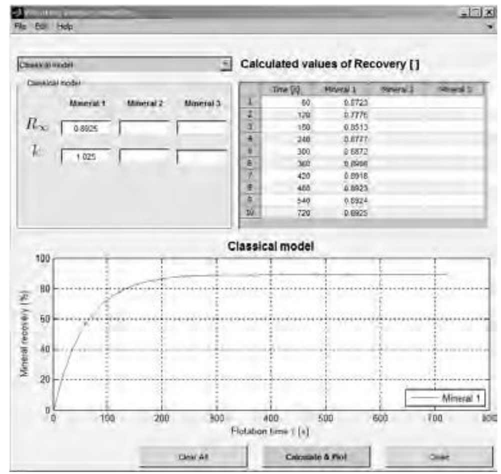

Figure 6. Kinetic presentation by Matlab

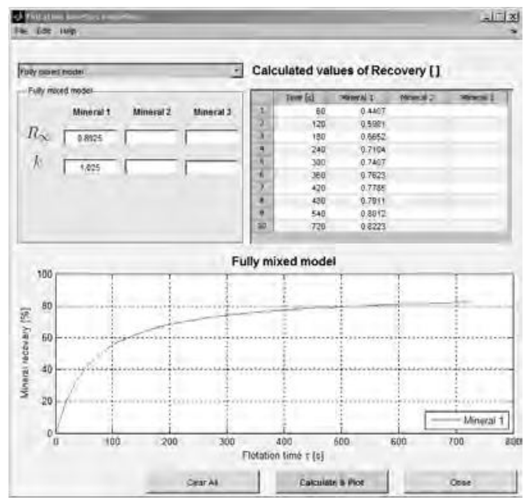

Figure 7. Kinetic presentation by Matlab

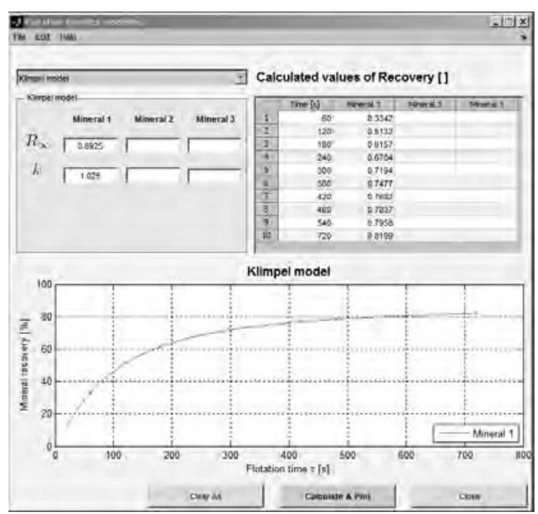

Figure 8. Kinetic presentation by Matlab

Table 1. Comparison of the kinetic models for flotation kinetic PbS (Sasa, Toranica)

(I%)	*Classical model*	*Klimpel model*	*Fully mixed model*
Time (s)	*Mineral (%)*	*Mineral (%)*	*Mineral (%)*
60	**0.5723**	**0.3342**	**0.4407**
120	**0.7776**	**0.5132**	**0.5901**
180	**0.8513**	**0.6157**	**0.6652**
240	**0.8777**	**0.6784**	**0.7104**
300	**0.8872**	**0.7194**	**0.7407**
360	**0.8906**	**0.7477**	**0.7623**
420	**0.8918**	**0.7682**	**0.7785**
480	**0.8923**	**0.7837**	**0.7911**
540	**0.8924**	**0.7958**	**0.8012**
720	**0.9025**	**0.8299**	**0.8223**

Table 2. Comparison of the kinetic models for flotation kinetic ZnS (Sasa, Toranica)

(I%)	*Classical model*	*Klimpel model*	*Fully mixed model*
Time (s)	*Mineral (%)*	*Mineral (%)*	*Mineral (%)*
60	**0.5723**	**0.3342**	**0.4407**
120	**0.7776**	**0.5132**	**0.5901**
180	**0.8513**	**0.6157**	**0.6652**
240	**0.8777**	**0.6784**	**0.7104**
300	**0.8872**	**0.7194**	**0.7407**
360	**0.8906**	**0.7477**	**0.7623**
420	**0.8918**	**0.7682**	**0.7785**
480	**0.8923**	**0.7837**	**0.7911**
540	**0.8924**	**0.7958**	**0.8012**
720	**0.8325**	**0.8200**	**0.8100**

CONCLUSION

According to the experimental results obtained in laboratory and industrial conditions, the Classical model is most appropriate for presentation of kinetic flotation, especially by means of MATLAB modeling.

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