THE KINETIC FLOTATION MODELLING OF CHALCOPYRITE FROM DOMESTIC ORES USING SOFTWARE TOOLS

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ABSTRACT. To improve kinetic flotation models, many first-order flotation kinetics models with distributions of flotation rate constants were redefined so that they could all be represented by the same set of three model parameters. As a result, the width of the distribution become independent of its mean, and parameters of the model and the curve fitting errors, became virtually the same, independent of the chosen distribution function. In our case, investigations of the chalcopyrite ores are carried out using the Classical model, Klimpel Model and fully mixed model. According to the experimental results obtained in laboratory, the Classical model is most appropriate for presentation of kinetic flotation, especially by means of MATLAB modeling.

KEYWORDS: investigation, modelling, kinetic, Matlab, Bucim

INTRODUCTION

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

- Clasical kinetic model, $\mathbf{I=I_o[1\text{-}e^{-kt}]}$
- Klimpel kinetic model, $\mathbf{I=I_o[1\text{-}—\qquad)]}$
- Kelsal kinetic model, $\mathbf{I\ =(i_o\text{-}\phi)(1\text{-}\qquad)+(1\text{-}\qquad)}$
- Modified Kelsal kinetic model – Gama model from Loveday, Innou, $\mathbf{I=I_o(1\text{-}(—)^P)}$

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 copper mineral will have the following equation (chalcopyrite):

$$\mathbf{I = I_o\,[1\text{-}e^{-kt}] = 89.25\ [1 – e^{-\,1.025xt}]}$$

According to the existing or previous kinetic investigations for kinetic flotation (Clasical kinetic model) for different oxide - sulphide minerals, the above mentioned models and constant k for copper mineral will have the following equation (65% chalcopyrite and 35% oxide minerals as cuprite, azurite, malachite):

$$\mathbf{I = I_o\,[1\text{-}e^{-kt}] = 73.5\ [1 – e^{-\,0.56xt}]}$$

According to the existing or previous kinetic investigations for kinetic flotation (Clasical kinetic model) for different oxide - sulphide minerals, the above mentioned models and constant k for copper mineral will have the following equation (65% chalcopyrite and 35% oxide minerals as cuprite, azurite, malachite), but with application of process of sulphidization with Na_2S, $(NH_4)_2SO_4$, NH_2SO_4 :

$$\mathbf{I = I_o\,[1\text{-}e^{-kt}] = 74.2\ [1 – e^{-\,0.61xt}]}$$

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 (chalcopyrite ores or mixed oxide – sulphide ores) enabling appropriate tabular or graphic presentation for Clasical kinetic model (I. Brezani, F. Zelenek), determining the constant kin the function of the time frequency of the useful reagent addition.

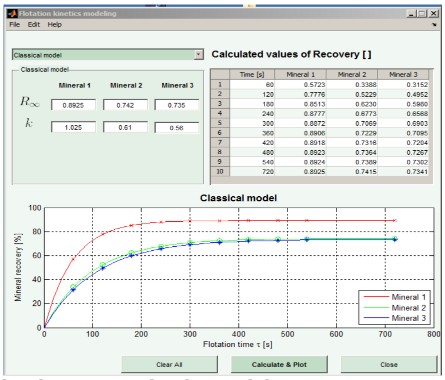

Fig. 1 Kinetic presentation by Matlab

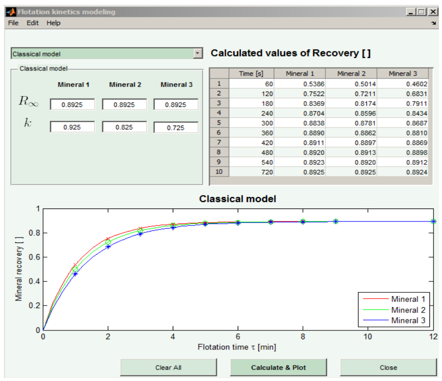

Fig. 2 Kinetic presentation by Matlab

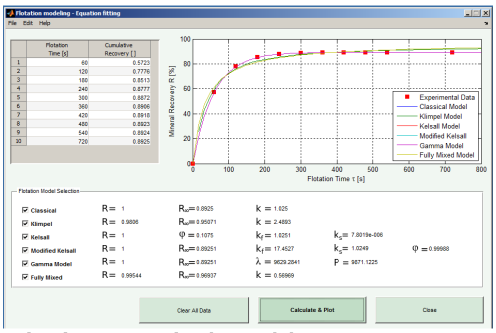

Fig. 3 Kinetic presentation by Matlab

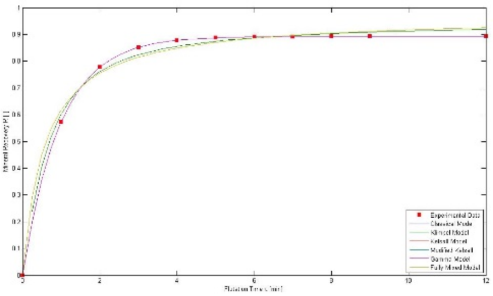

Fig. 4 Kinetic presentation by Matlab

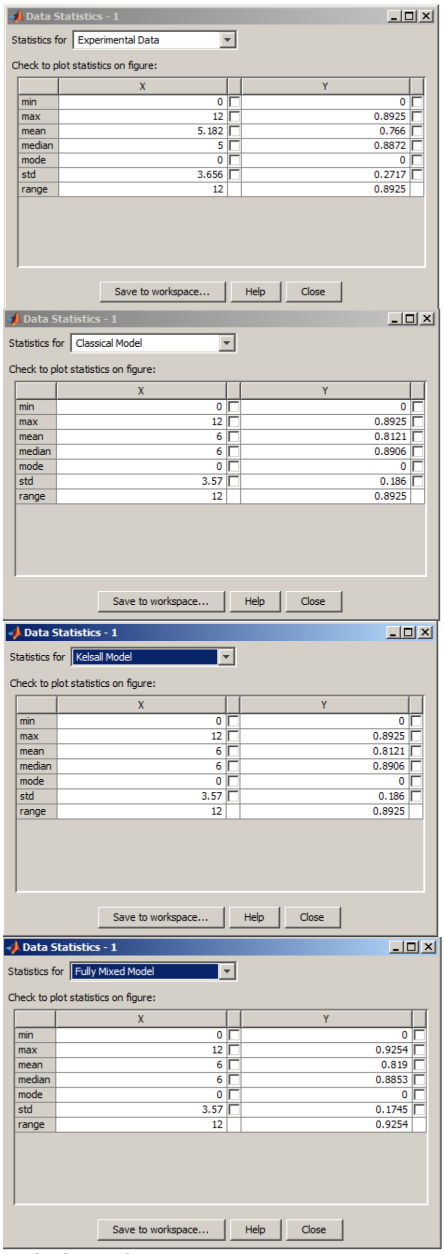

Fig. 5 Results in total

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

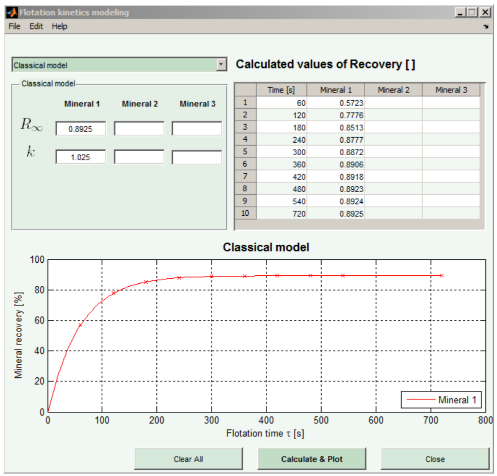

Fig. 6 Kinetic presentation by Matlab

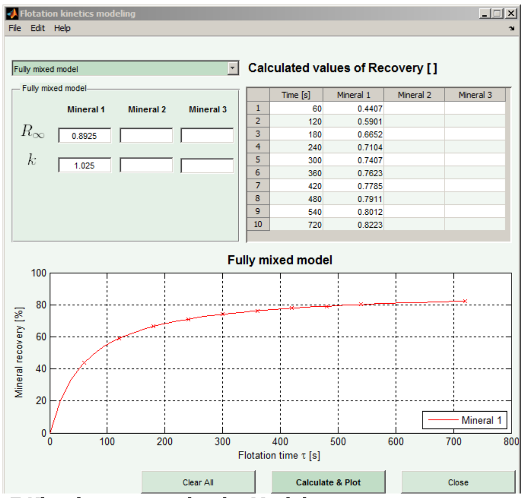

Fig. 7 Kinetic presentation by Matlab

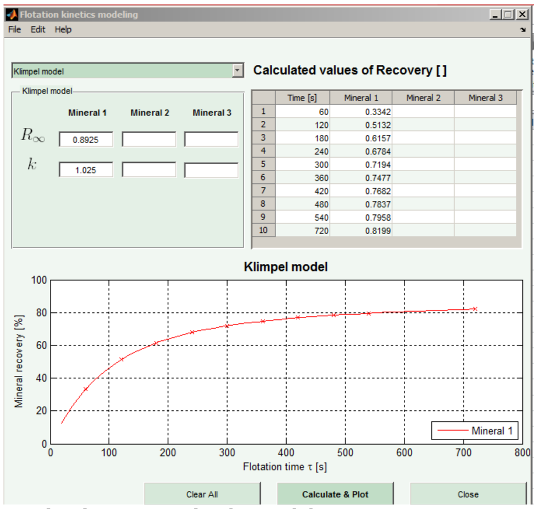

Fig. 8 Kinetic presentation by Matlab

Tabl. 1Comparison of the kinetic models for flotation kinetic

(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	**0.8925**	**0.8199**	**0.8223**

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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