Experimental studies and modeling of the dissolution processes of metals from WEEE

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Objectives

- ✓ Analysis of literature data and establishing the research strategy for modelling of the dissolution process of metals from WEEE
- ✓ Experimental studies of the dissolution processes of metals from WEEE
- ✓ Kinetic modelling of metals dissolution from WEEE
- ✓ Economic feasibility study and statistical analysis on proposed models and processes
- ✓ Environmental assessment of copper dissolution processes from WEEE using persulfate

Literature analisys and research strategy

Specifically, about 6o bibliographical references were studied and the main analysis was focused on:

- The importance of recovery metals from WEEE
- General procedures for the capitalization of metal dissolution from WEEE
- The dissolution medium utilized
- Modeling of metals dissolution from WEEE

Experimental studies

- ✓ Pure copper dissolution of WEEE using persulfate as oxidation agent
- ✓ Pure zinc dissolution of WEEE using persulfate as oxidation agent
- ✓ Brass dissolution of WEEE using persulfate as oxidation agent
- ✓ Copper dissolution from LCD boards using persulfate as oxidation agent

Kinetic modelling and statistical analysis

- ✓ Statistical evaluation of the factors affecting the dissolution of WEEE using sodium persulfate
- ✓ Kinetic models based on the analysis of the dissolution of the copper, zinc and brass WEEE in a medium of sodium persulfate
- ✓ Kinetic modeling of Cu from LCD boards using persulfate

Statistical analysis

- 8 models have been developed which adequately describe the dissolution process of metals and alloys from WEEE in different cases
- The developed models can be valued for describing similar products involving dissolution of metals or alloys.

Kinetic modelling

- We propose three kinetic models with different complexity, which calculate the changes of the interaction surface

Publications

- **Ioana A. Popescu**, Tamás Varga, Árpád Imre-Lucaci, Tibor Chován, Petru Ilea. Kinetic Modelling of Copper and Zinc Dissolution from Brass Obtained from Waste Electrical and Electronic Equipment. Computer Aided Chemical Engineering. 33: 1147–1152 (2014)
- **Ioana-Alina Popescu**, Attila Egedy, Tamás Varga, Szabolcs Fogarasi, Petru Ilea. Kinetic Modelling Of Copper Leaching Process Using $FeCl_3$ For Recycling Waste Electrical And Electronic Equipments. Bulletin of Romanian Chemical Engineering Society. 1: 1 (2014)

Publications under review

- **Ioana A. Popescu**, Tamás Varga, Árpád Imre-Lucaci, Petru Ilea. Statistical Evaluation Of Factors Affecting The Leaching Process Of Waste Electrical And Electronic Equipment Using Sodium Persulfate. **Chemical Engineering Communications .**
- **Ioana A. Popescu**, Tamás Varga, Attila Egedy, Szabolcs Fogarasi, Tibor Chován, Árpád Imre-Lucaci, Petru Ilea. Kinetic Models Based On Analysis Of The Dissolution Of Copper, Zinc And Brass From WEEE In A Sodium Persulfate Environment. **Computers & Chemical Engineering.**

Future publications

- Kinetic modeling of Cu from LCD boards using persulfate
- Environmental assessment of copper dissolution processes from WEEE using persulfate

Conference

- **Poster:**

Ioana A. Popescu, Tamás Varga, Árpád Imre-Lucaci, Tibor Chován, Petru Ilea, Kinetic Modelling of Copper and Zinc Dissolution from Brass Obtained from Waste Electrical and Electronic Equipment, Proceedings of the 24th European Symposium on Computer Aided Process Engineering – ESCAPE 24. June 15-18, 2014. Budapest. Hungary.

- **Oral communication:**

Popescu, I. A., Varga, T., Imre-Lucaci, Á., Ilea, P. Experimental design based on analysis of the leaching process of cooper and zinc from waste electrical and electronic equipment, XXXIII-rd Romanian Chemistry Conference. 1-3 October 2014. Calimanesti-Caciulata. Romania

Popescu, I.A., Egedy, A., Fogarasi, S., Varga, T., Ilea, P., 2013. Kinetic modelling and optimisation of copper leaching process from waste electrical and electronic equipments, 18th Romanian International Conference on Chemistry and Chemical Engineering, Sinaia, Romania.

Attila Egedy, **Ioana-Alina Popescu**, Szabolcs Fogarasi, Florica, Imre-Lucaci, Árpád Imre-Lucaci, Tamás Varga, Tibor Chován, Petru Ilea. Computer Aided Design Of Electrical Waste Leaching Technology. XXXIII-rd Romanian Chemistry Conference. 1-3 October 2014. Calimanesti-Caciulata. Romania.

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