formal model is being programmed in corresponding language of the presentation of the knowledge.Specifics of the subject knowledge on renewed source is presented by four heterogeneous components at least, which are bound between themselves to one or another extent:

-A - technical;
-B - natural-ecological;
- C - engineering-geological;
- D - economic.

For each of four formulated aspects of presentation of the knowledge, conceptualization comes to:

- building of glossary terms;
- building of classification tree of notion;
- building of binary relations diagram.

And then, dictionary of concepts, plural attribute copies and classes, as well as included trees of categorization are built for each classification tree.

Following relations between dictionary concepts could be distinguished. They are such as:

- kind_of;
- part_of;
- has;
- is_a;
- see_also and others.

The Last of given relations are being entered not declaratively, but procedurally in analogy with programming languages, supporting abstract types data.

As our studies show, a dictionary of concepts per each chosen component (A, B, C, D) contains about 1000 notions. The Typical example attribute notion in classification and included trees are following: power, developer, manufacturer, cost, completing, average month and annual wind velocity, average number of sunny days in a year, etc.

At stage of formalization, it is necessary to select the most identical classification model for presentation and processing of obtained data. As it is shown in [1], the semantic networks under frames, rule-oriented model and model of the inductive generalization are being referred to the most typical representative of such formalisms, and possible, their mixed interpretation.

Let us illustrate the reviewed stage on example of the frame-based model. We shall remind that frame is a minimum possible description of essence of some notion, event, phenomena, situation, process or object.The Frame has nearly uniform structure and consists of standard units, named slot.

Exists several ways of the reception by slot the knowledge in exoframe: by default from protoframe (default - a knowledge), through subsequent characteristic from frame, specified in slot A_kind_of, per formula, specified in slot, through joined procedure, obviously from dialogue with user (the expert) and, finally, from database. As its seen in given diagram, the most important characteristic of frame-based model is a study of features of AKO (A_kind_of) relationship.

Thereby, frame-based model, for our application domain, for component A and B particularly and C possibly, is most suitable since it supports the hierarchy inherent to classifying and including tree, which is obtained at the stage of conceptualization.

Availability of evident procedural knowledge in description of the application domain (the component D and partially component C), points out that in this case it is better to use the rule-oriented formalism, under which operational memory of program is presented by two areas - an area of facts and area of the rules - strictly product. And methods of the work with these areas is being realized on principle "identification - an action" [1].

The Recommendations on inductive generalization model use are formulated by the author in [1].

The Last stage in chain considered is a stage of the programming. Here we shall note that for programming at a level of frame-based model in semantic set, it is reasonable to use such languages as FRL, KRL or Karre frame based shell. In the event of rule-oriented model, languages of the OPS-5 group are used. And, finally, for all three models it is possible to use the object-oriented programming languages.

References:

1. Moskalenko YU.S. Presentation and processing the knowledge in training system: Training book - Vladivostok: Publishers DVGTU, 2000. - 125 p.

The article is admitted to the International Scientific Conference «Modern High Technologies», Spain, Tenerife, November 16-23, 2007, came to the editorial office on 15.11.07

NEW APPROACHES TO STUDYING SILICON MELT CRYSTALLIZATION PRINCIPLES

Nemchinova N.V., Tulisov S.A.
Irkutsk State Technical University
Irkutsk, Russia

The severization of requirements at the consuming end (producers of organic silicon compounds and semiconductor products) to the quality of silicon obtained at silica-containing batch materials melting process in arc furnaces makes it nec-

essary to investigate the principles of impurity elements distribution both on melt products and silicon pool.

At silica carbothermic reduction the impurity elements from silica-containing crude ore (quarts), carbonic reducing agents, carbon electrodes, furnace lining and auxiliary process materials are reduced and transform into the melted silicon. To determine the principles of impurity distribution between the products of melting process (silicon, mixed dust-gas and slag) the data on physicochemical properties of the substances entering the process are used: the temperature and heat of melting, vapors dissociation tension, constituents' activity, formation heat, Gibbs thermodynamic potential, etc. And for the obtained crystalline silicon properties forecasting (as in the case of various alloys obtaining) the knowledge of binary and ternary diagrams is of great importance. The liquid melt silicon obtained in an electric arc furnace represents a multicomponent system with 0,1-2% ballast content. At the solidification the impurity elements form various intermetallic compounds, non-metallic compounds with silicon (slag enclosures), dissolved oxygen, silicon carbide and unreacted hydrogen of reducing substances and crystal silica [2, 3]. For the multicomponent systems of any type the forecast of properties on the basis of binary and ternary components systems data is possible if their image is used according to the method of optimal projections [4]. Geometrical methods have an important advantage, which makes possible to express the quality and quantity dependence of the properties on the composition also in the case, when the algebraic expression of this function in unknown to us. More over it is common knowledge that properties vary continuously within the limits of one and the same phase existence fields and undergo sudden alternations (kinking, bending) at the given phase conversion into another one. That is why, if it is possible to restrict the crystallization region of any phase, the general regularity detection in properties alteration of the whole region is possible when oriented to comparatively inconsiderable number of datum points. Thus, it is sufficient to study experimentally the properties of three-four compositions of the system, which correspond to the specified limits, to forecast the system's properties values with some degree of certainty within the whole region [5].

The construction of binary and more complex constitutional diagrams by experimental methods or with the help of rigorous thermodynamic calculations is a labour intensive, time-taking and very often – a stubborn problem. In this connection the approximate calculation methods of constitutional diagrams construction [6] are extremely productive. Model representations of a melt composition and repeating units' interaction energy in solution and solid phases lie in their basis. The initial calculations data are comparatively easy to obtain for ideal and regular solutions models. The necessity to use approximate calculation methods is connected with the fact that a production manager, in conditions of ultimate product requirements change, needs to have the computation data forecasting the melt emerging temperature, crystallization path, comparative crystallization rate, silicon phase composition.

For the liquidus and solidus curves construction for a predetermined composition of the n-component system we accepted as the main assumption (initial approximation) the statement that these systems quite adequately satisfy the model of regular solutions. Indirectly it is proved out by the author's multicomponent oxide systems' data [4], which testify that with the complication of the system's composition, it approaches ideal solutions in its properties.

For the calculation of liquidus temperature, the solution and solid phases' composition in the field of silicon crystallization the following data are necessary: the amount and concentration of the introduced components; values of mixing energies within the binary system, eutectic temperature and also values of distribution coefficients of impurity elements in silicon melt. In the initial stage of our research the separate flux components' thermodynamic properties and silicon-based binary systems data base is formed. The data base will allow passing directly to modeling on «DIATRIS 1.2» and «MULTICOMDIA 2.0» programs' flows [7].

References:

1. Popov S.I. Metallurgy of silicon in three-phase ore-smelting furnaces. – Irkutsk, 2004, p. 237.

2. Investigations of refined metallurgical silicon impurities' phase composition // IrSTU Bulletin. Irkutsk: Publishing House of IrSTU, 2007, №2 (30), V.1, pp. 30-35.

3. Suvorova L., Nemchinova N. Application of electron-probe X-ray microanalysis method for investigation of metallurgical silicon // Materials of the 19th International Congress of X-ray Optics and Microanalysis «ICXOM 2007», 16-21 September 2007, Kyoto (Japan). – Kyoto, 2007. P. 145.

4. Berezhnoy A.S. Multicomponent oxide systems and their value for silicates technology and petrology // Experiment in the area of technological mineral formation. – M.: Nauka (Science), 1975, pp. 8-12.

5. Kurnakov N.S., Anosov V.Ya., Ozerova M.I., Fialkov Yu.Ya. Principles of physical-

chemical analysis. – M.: Nauka (Science), 1976, p. 504.

6. Suvorov S.A., Semin Ye.G., Gusarov V.V. Phase diagrams and oxide solid solutions' thermodynamics. – L.: Publishing House of LSU, 1986, p. 140.

7. Nemchinova N.V., Udalov Yu.P., Klyots V.E. Silicon-based multicomponent system crystallization field investigation // Materials of International Council "Present-day methods of complex ore processing and alternative mineral raw material" ("Plaksin Readings-2007"), Apatity, October, 1-7, 2007. – Apatity: Publishing House of Mining Institute of Kola Scientific Center RAS, 2007. – Ch.2, pp. 468-471.

The investigations are supported by the project of The Ministry of Education and Science of Russian Federation № RNP 2.1.2.2382 according to the analytic department programme «The development of Higher School Scientific potential (2006-2008)»

The article is admitted to the International Scientific Conference «Innovation Technologies», USA, New-York, December 19-27, 2007, came to the editorial office on 19.10.07

ENERGY TECHNOLOGICAL COMBINING OF BULK PETROCHEMICAL ENTERPRISES*

Plotnikov V.V.
Kazan State Power Engineering University
Kazan, Russia

The petrochemical industry performing the processing of hydrocarbon material and being in the number of fuel and energy resources consumption leaders is characterized by a relatively low efficiency of the supplied energy use.

For the petrochemical energy industry enterprises the efficiency increase main direction one can consider to be the energy saving organization based on the principles of energy–technological integration.

The search for viable solutions on the organization of energy-technological complexes – is an extremely difficult task that requires carrying out a comprehensive analysis of the original system and the one being synthesized. The accepted decisions optimization can be reached only at the implementation of mathematical models formed depending on the set task class. The following tasks can be referred to the number of them:

- the search for superfine production facilities' operating regimes interrelated with energy supply systems;
- the industrial facility's efficient management with due consideration of its infrastructure at superimposition of indignations associated with material and energy imbalances;
- the minimization of specific material and energy consumption for production;
- the efficiency analysis of the synthesized object on a selected criterion in the dynamics of its development, etc.

An instrument for searching and selecting innovative solutions is the fully formed by now integrated methodology of complex industrial systems' analysis and synthesis within the framework of the present and projected technological complexes.

The development of a universal method combining isolated methods is a topical and many-sided task.

*The work is performed within the framework of the RF President grant MK-4325.2007.8

The article is admitted to the International Scientific Conference «Technologies-2007. Energy efficient technologies», Kemer (Turkey), May 20-27, 2007, came to the editorial office on 18.11.07

ETHYLENE PRODUCTION ENERGY-TECHNOLOGICAL COMPLEX ORGANIZATION

Plotnikova L.V.
Kazan State Power Engineering University
Kazan, Russia

An energy saving upcoming trend at petrochemical enterprises is the organization of energy-technological complexes created on the base of secondary energy resources complex utilization systems. The ethylene production – is a large consumer of fuel and energy resources. At that, the considered production is characterized by a considerable output of secondary energy resources. Thus, in ethylene production there are favourable conditions for the energy-technological complex organization.

The first stage in construction of an energy-technological complex is the system's work efficiency estimation by means of a system analysis including the analysis of the considered object's relations structure, the analysis of thermal and thermodynamic effectiveness. The system analysis allows detecting the dependencies between the ethylene production scheme elements, defining the optimal sequence of the scheme computation, re-rating of the elements' efficiency, determining the value of technically usable energy, evaluating the energy saving reserves and revealing the optimum alternative for the energy-technological complex construction.