MULTIMEDIA ATLAS OF FLUID INCLUSIONS IN MINERALS

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Increase of expressive opportunities of computers for presentation of the educational and scientific information has enabled to create scientific-educational multimedia system. The electronic form of presentation of the scientific-educational information represents convenient alternative to traditional paper materials: to directories, encyclopedias, textbooks, manuals, journals etc. The main advantages of the multimedia form of presentation of the educational, scientific or guide information - compactness, the big expressive abilities in presentation of teaching material (video, sound, dynamic images - animations), interactivity, low cost. All this promotes creation and active use of scientific - educational multimedia CD ROM and resources in Internet. Thus, first of all, educational and scientific directions containing a great body of visual information and illustrative materials deserve presentations in the electronic form.

Researchers of the Laboratory of Thermobarogeochemistry together with experts of the Geoinformation Laboratory and GIS centre "infromTerra" (Geological faculty, Moscow State University) have developed the CD ROM version of multimedia-system "Atlas of fluid inclusions in minerals".

Photo and video documentation in "Atlas ..." presents various structures and formation conditions, as well as relative time and formation modes of the these microvolumes, which objectively reflect continuous changes of environment during the processes of the formation of the parental material of minerals.

Importance of the creation of the multimedia-system "Atlas of fluid inclusions in minerals" on CD ROM is defined also by the following circumstance. We have experimentally and analytically investigated many thousand inclusions of the mineral forming and surrounding mobile medium from different ores of industrial-genetic grades and types of deposits, as well as endogenic rocks. Their varieties demonstrated in Atlas objectively reflect significant, sometimes very fine distinction in genesis of mineral formations. They also present objective keys for identifying the genesis of minerals and their constituents. The nature of minerals has preserved as microobjects naturally widespread systems of fluid and melt inclusions that are typical of different processes and phenomena of the mineral genesis in the earth's crust.

CD ROM "Atlas of fluid inclusions in minerals..." contains the following sections: fundamentals of thermobarogeochemistry, including the text, diagrams, animations, photos and video materials, as well as additional set of necessary context-dependent manuals including much more expanded photo and video examples of fluid inclusions showing the processes in fluid inclusions which cannot be discussed within the framework of ordinary program.

Use of multimedia technologies and CD ROM " Atlas of fluid inclusions in minerals " gives the teacher completely new methodical tools. The difficult theoretical and practical questions demanding activity of spatial and dynamic thinking, precise recognition and identification of images become more accessible and clear after their visualization on the screen of a computer or the big screen of a lecture hall through multimedia projector with comments of the teacher. We can be absolutely sure that students will see "under microscope" everything told and demonstrated by the teacher. They can apply in the subsequent independent researches the received knowledge and return for help to the Atlas for solving questions arising during the process of research. In those sections where the educational information contains a plenty of texts, use of electronic presentation of the information allows to arrange educational and scientific materials for granting students alternative ways of study depending on their initial educational background. Besides, there is an opportunity to organize fast and effective search of necessary data in the big massif of information.

In the first part of Atlas, it is possible to see microphotographs of solidified inclusions of the mineral forming melts (usual and residual melts with a very high content of minerals. The well-crystallized inclusions are typical for the deep-seated minerals formed during slow cooling. Inclusions of glass are formed at fast cooling during volcanic eruptions and emissions of lavas on surface. However there are also intermediate inclusions between the well-crystallized and amorphous micro portions of the mineral forming melts. This means that the glass inclusions with the crystalline minerals-inclusions and the crystalline solidified inclusions with relicts of the glass did not have time to solidify because of the further fast cooling of minerals and their aggregates in the rocks and ores.

Study of composition of magma microspecimens in inclusions of the metamorphosed effusions with the modern physical methods allow petrographers to judge about the exact composition of the parent magma and identify the primary effusions on the basis of solidified inclusions in the stable minerals, especially in quartz, and not on the basis of altered samples. Of course, petrologic investigations of igneous rocks will be enriched with new data during the application of solidified inclusions in the magmatic minerals. Glass inclusions of the deep microlapillis twisted in the turbulent gas flows and shock inclusions in the impactite glass can be noted as the exotic ones.

The second section represents crystal-fluid inclusions of residual melt-brines and melt-solutions. They are distinctly divided into the residual solution-melts without halogen mineral-inclusions and melt-brines with a great volume of halite and sylvine in the vacuoles combined with silicates and oxides including ore mineral-inclusions. Such inclusions differ from all other solidified ones of the common melt by the great gas bubble and small content of aqueous liquid, which are typical for pegmatites, carbonatites and apatitolites. They have essentially lower temperatures of homogenization (first type

homogenization in the liquid phase). Sometimes the liquation phenomena on the silicate, carbonatite and saline melts are essentially observed in them. In spite of this the ore inclusions of small volume are transferred into the liquid melt.

In the third and fourth sections the gas and gas-liquid inclusions showing minerals crystallization from the gas and hydrothermal solutions are demonstrated.

The fifth chapter is devoted to morphological peculiarities of mineral-inclusions grown in the closed volume of the conserved inclusion vacuole.

Of significant interest are recently discovered inclusions of hydrocarbons (petroleum and bitumen in endogen minerals) demonstrated in the sixth section. Actually these inclusions of hydrocarbons are not exotic, but widespread formations. Hydrocarbons in inclusions are present as gas, liquid and solid phases.

The seventh section shows genetic varieties of inclusions of mineral forming environments in relation to the moment of their preservation in the mineral-owner (initial, pseudo-secondary, secondary inclusions).

In the eighth part of "Atlas" photo and video materials show separate moments of the phase dynamics of transitions and transformations in the inclusions during their heating and cooling in a wide range of positive and negative temperatures. Experimental researches of processes of the dynamics in inclusions allow observing such processes and phenomena inside the closed geochemical microsystems, which are not accessible to other methods of research.

The final ninth section of "Atlas "presents results of the study of morphological features of vacuole inclusions, as well as quantitative and qualitative analyses of mineral-inclusions.

"Atlas of fluid inclusions in minerals" on CD ROM, undoubtedly, will be used by mineralogists, petrologists and geologists engaged in the study of fluid inclusions, mineral raw material and cultivation of crystals.