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*"Nature is the composition  
of elements which our life  
consists of, by using  
which we get happy  
and bitter experience"  
(V.Sherbuls, 1894)*

### **Problems of toxic of precious stones**

The words of a scientist,, academician of the French Academy of Sciences, the founder of modern estetic science Victor Sherbuls are taken today as a philosophic basis of ecology - a science about environment. For the last 100 years these words have not lost their importance and even nowadays give us a possibility to widen our knowledge of the world. A person with his phsycology, ability to think, biological structure and even, behaviour is always opposite to environment, where he comes from, which gives him resources for existence. Everything that surrounds us counteracts with us and this counteraction is the life itself.

The results of investigation and studying the assortment of modern market of jewelry give us a possibility to speak seriously about a real danger for our health.

First of all, precious stones have natural peculiarities, that can be defined as negative and can be listed as those limiting the use of different products. Secondly, they have artificial improvement - the change of colour of some stones under the effect of x-rays, chemical elements or temperature, the possibility of avoiding defects with the help of synthetic resins and crystallization of neorganic substances. Such influence on the stones, of course, improve their appearance, but this can lead to serious negative effects on the user of these products. Thus, the real situation exists, when almost all known natural stones are improved artificially.

Another aspect of ecological investigation appears in connection with the vital necessity of studying of numerous artificial substitutes of natural stones, which are quite widespread, and of synthetic substances which are widely used while producing jewelry.

Traditional literature often mentions that precious stones and talismans can have a great positive effect on a person and even cure different illnesses. Some facts of such influence are partially scientifically grounded. But you mustn't believe such stories. For example, natural amber contains from 2 to 8 per cent of amber acid, which is a strong biostimulator and, owing to this property, according to the authors of some popular books, it may positively influence on

the thyroid gland, when you wear it. However, you may find amber acid in rather large concentration in grape, cabbage, apples and other fruits.

A well-known stone cornelian can contain the mixture of radon or arsen, which in small concentration can have a curative effect on a person. But it is evident that we should take a course of therapy only in case when all stages are studied and the process of recovering is proved.

Counterfeits of precious and decorative stones may become the reason of chemical poisoning, allergy, radiation, lead to phsychiatric problems, etc. All these aspects of gemology are very actual, as the possibilities of modern technologies allow to create such artificial materials, which can't be differed from real natural stones, but at the same time they can be harmful in case of their traditional usage.

The most negative effect of the precious stones on a person is done as a rule by penetrating of their particles into a human body, for example, in the process of extraction or processing of a stone or as a result of contact with a product. But the damage may be also done as a result of other physical actions: radiation, magnetic and electrical fields.

It is important to know such a principal peculiarity of the interaction of a person's organism and a stone; none mineral is assimilated by an organism in its natural state, that is in crystal condition. Mineral substance, before starting to take part in physiological process, is obligatory ruined, that is, it is transferring to ionic or molecular form.

As a result of investigation, we can say that minerals which contain such elements as -As, Sb, Hg, Ba, B, Cd, Co, Pb, Cu, Mo, Ni, Se, Tl, Be, U, V, Zn, Te, Cr, In, Bi, F, Al, Sr, S - can become toxic in certain conditions. Among them the most dangerous are such minerals as: As, Sb, Cd, Hg, Pb. (Grigoryev, 1981). Highly toxic are practically all minerals of uran, copper, in particular, malachite, turquoise, azurite, diopaze. Jewelry made of malachite, turquoise, azurite, smitsonite, diopaze and some others must be dressed on fabric, but not on a naked body.

Less toxic, but also dangerous are galogenidz, sulfides, phosphates, which may be found in agate, turquoise, nephrite, azurite and other precious stones.

Even calcite can be dangerous in huge amounts. When these minerals counteract with the skin, under the influence of sweat and temperature, they decompose, emitting toxic substances, for instance, sulfuric acid, and this results in burns, ulcers, allergy.

Natural minerals are dirty compounds. It is the law of the nature. That's why using modern analytic methods, in any mineral, we'll find 92 chemical elements of the periodical system. So, stones are poisoning compounds. Such conclusion has a relative importance because the toxic properties of minerals, besides chemical composition, depend on their crystal structure, the form of location of toxic elements, their valency state and the nature of chemical ties with other atoms.

The most important are the concentration and valency state of atoms in compounds. For example, arsen in garlic is a medicine, but arsen as a mineral, like its crystal-chemical analogue Sb - arsenolit -  $\text{As}_2\text{O}_3$ , claudetit -  $\text{As}_2\text{O}_3$ , valentimit -  $\text{Sb}_2\text{O}_3$ , senarmopit -  $\text{Sb}_2\text{O}_3$  is a highly dangerous compound.

Radioactive minerals are minerals that contain radioactive elements in the enormous quantities. We know about 250 radioactive minerals which belong to different classes. Precious stones contain radioactive minerals only as mixture, but in two forms - izomorfic and mecanic. The second form contains little quantity of radioactive minerals.

It is useful to know that minerals of uran are dangerous not only owing to their radioactive action, but also in connection with their toxic properties.

As to the influence on a person and other organisms of the magnetic and electrical fields, which are generated by some minerals, it is a white stain in bioecology.

According to A.C.Talantsev and G.A.Petrova (1996), in jewelry, practically all natural zircons are radioactive, with the level of radiation from 260 to 280 microrentgen per hour for a carat of a stone, owing to the mixture of torii and uran in this precious mineral. These authors, in particular, think, that so well-known in history diamonds of Tyuilyc, king Alfons XII, in reality were "Ceylon diamonds", that is natural crystals of zircon with a high level of radioactivity.

In charoit and products made of it there is a low level of radioactivity, but sometimes we may find more intensive radioactivity which is connected with such minerals as ekonit and steatit.

Low level of radioactivity is found in some kind of cornelian, onyx, agate. In Asian and Mongolian deposits these minerals sometimes have 2-3 times higher level of radioactivity as they contain particles of uran minerals.

Modern medicine says that low radioactive precious stones have curative properties, high radioactive precious stones are dangerous for the health of a man.

This is, of course, a qualitative evaluation. It also doesn't take into account the nature of radiation (alfa-beta, gamma-rays). A quantitative evaluation of precious stones, taking into account their radioactive and useful (harmful) properties, and also their legislature regulation in Ukraine - is a vital problem of nowadays.

The problem of toxic properties of precious stones is quite new and that's why it hasn't been fully studied yet. Now it is being only studied on the qualitative level. The quantitative evaluation of the toxic properties of minerals is the problem of a future.