



To 80th anniversary of birthday of Professor Valeriy Arnoldovich Tyagai

“It always seems to me cruel and premature death of those who are preparing something immortal. ... those who think about future generations and want to live in their works, always die prematurely, because death cuts something from them.”

Pliny the younger 97 year.

Valery Arnoldovich Tyagai is one of the most talented scientists working at the Institute of Semiconductors of Academy of Sciences of UkrSSR in 1963 – 1979.

Since 1961, he was the post-graduate student of the Moscow Frumkin Institute of Electrochemistry, where successfully defended the PhD thesis and was invited in 1964 to work at the Institute of Semiconductors of Academy of Sciences of UkrSSR. V. Tyagai was involved in main investigation area of Department of Surface Phenomena – fundamental bases of control of electrophysical properties of semiconductors surface by surface doping.

Due to all-round and fundamental education in the field of theoretical physics and chemistry, V.A.Tyagai provided a notable influence on scientific atmosphere in those divisions which were engaged in studying the physical phenomena on a real surface of semiconductors.

As a chemist, Valeriy Arnoldovich introduced some new approaches to the semiconductor physics: electrochemical etching, electroreflection, chromatography, electrode potential, *etc.*

In 1974, V.A.Tyagai has headed new department No 21 at the Institute. Here, he gave start at least to two fresh directions of researches: (1) application of electrooptical effects at the boundary pure semiconductor surface – electrolyte, and (2) detailed research of noise at the boundary semiconductor – electrolyte.

The first of them allowed to reveal and explain some the following new phenomena:

- additional interference of light in the area of a strong field caused by the change of refraction under conditions of electroreflection,
- influence of structural variations in ternary semiconductor compounds on the spectrum of fundamental absorption and dispersion of an electronic spectrum in the area of a strong field,
- exciton disorder in the area of a strong field and so on.

The second direction (use of the fundamental nature of noise related with the current flow through a liquid – crystal interface) was completely unique. It has led to new conceptions in the field of electrochemistry, since it showed an additional channel for identification of

electron transfer process when exchanging the ion charge from a solution with the electronic ones in crystals over the wide area of experimental conditions. This direction was widely adopted at chemical Institutes both in the former USSR, and abroad and became an integral part of scientific conferences on electrochemistry.

As the man of effective idea generator, V.A. Tyagai stimulated a wide range of researches of semiconductor-electrolyte interface and adjacent areas not only at the institutes of Ukraine, but also in St.-Petersburg, Moscow, Novosibirsk and Tbilisi. Among his grateful co-authors, there were tens the most different experts from physicists to chemists and biologists.

Possessing strategist research intuition in a combination with inventive talent, V.A. Tyagai based practically important direction of sensor technique, namely, the gas analysis by semiconductors. At the Institute of Semiconductors, there were developed some research areas with his direct participation:

- the effective electrooptical modulators of a light beam;
- scanning laser control units for semiconductor wafers quality control.

Some bright results, obtained at that time, could be described as:

- Light interference in the area of a space charge in crystals of cadmium sulphide. It has appeared that under the influence of a strong field the refraction index in a thin layer near the sample surface is changed. Owing to this phenomenon, it is possible to observe interferential colours in them.

- Influence of solid solution composition inherent to double semiconductors on fundamental absorption of crystals.

- Attraction of the current noise for identification of mechanisms of charge transfer under electrochemical reactions. This work appeared to be the pioneer one and received a huge resonance.

The part of results of Tyagai's scientific activity was used in the excellent monograph “Electroreflection of light in semiconductors”, which was estimated by S.I. Pekar in due time as classical. Unfortunately, this monograph was published already after sudden death of Valery Tyagai in 1979. V.A. Tyagai was co-author of more than 200 articles.

Under the mentorship of Valeriy Tyagai the «electronic tongue» (on the basis of a sensor array of “silicon – electrolyte”) was created for the first time in Ukraine. “The electronic nose” (adsorption of molecules in polymeric materials) was proposed and realized as well. These areas are under development at the Institute of Semiconductor Physics up to now.

It is necessary to tell some words about Tyagai as the person: he was the good son, brother, lovely husband, father, great companion, excellent reader, reviewer, singer of bard songs, author of comic couplets and fan to go to campaigns and to ski. We thank the lucky stars in time spent together.

Among the scientific school of Prof. Valeriy Tyagai, we can enumerate Gennadiy Kolbasov, Yuriy Shirshov, Vitaliy Bondarenko, Vadim Yarinovsky, Natalia Petrova, Nina Samborskaya, Valeriy Sterligov, Alexander Yevstigneyev, Alla Krasiko, Vitaliy Omelchuk, Vadim Popov, Natalia Rastrenenko, Feliks Nazarenkov, Olga Dubinskaya, but this is not a full list.

Main dates of V.A. Tyagai’s life

1938, 19 December – born in Kyiv.

1956 – entered the chemical department of Kyiv Polytechnical Institute.

1961 – completed his studies at Kyiv Polytechnical Institute.

1961 – joined to the Moscow Institute of Electrochemistry, Academy of Sciences of the USSR.

1964, October – was conferred with the doctor’s degree (Chemistry) with the title “Electrochemical properties of Cadmium Sulphide single crystals”.

1964 – began to work at the Institute of Semiconductors, Academy of Sciences of UkrSSR.

1967 – developed the method of chemical sensibilization of cadmium sulphide single crystals.

1968 – first investigation of noise under anode oxidation of cadmium sulphide.

1972 – research of strong field influence on electroreflectance of oxidized silicon.

1973 – was conferred with the doctor’s degree (Chemistry) “Electroreflectance of light and noise in electrochemical systems”.

1974 – investigation of impurity electroreflectance and electroabsorption of CdSe crystals.

1977 – study of photoelectrochemical processes at semiconductor – electrolyte interface and their application for recording the holograms.

1978 – head of the department of physics-and-chemistry of semiconductor surface at the Institute of Semiconductor Physics of the Academy of Sciences of UkrSSR.

1979, 1 February – died in Kyiv.

Selected bibliography

1. Tyagai V.A., Pleskov Yu.V. Doklady of the Academy of Sciences of the USSR. **10**, 341 (1961).
2. Tyagai V.A., Pleskov, Yu.V., Solid State Physics (1962).
3. Tyagai V.A., Izvestiya Akademii Nauk USSR (1963).
4. Tyagai V.A., Electrochemistry (1965).
5. Tyagai V.A., Bondarenko V., Snitko O.V., Ukr. J. Phys. (1967).
6. Tyagai V.A., Lukyanchikova N.B., Electrochemistry (1968).
7. Tyagai V.A., Evstigneyev O., Snitko O.V., Semiconductors (1972).
8. Tyagai V.A., Popov V.B., Bulakh B., Semiconductors, (1974).
9. Tyagai V.A., Sterligov V., Kolbasov G., Electrochimica Acta (1977).

Prof. Yu. M. Shirshov and disciples,
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