PRACTICAL ELABORATIONS (Basic results in R&D)

The study of combustion of various condensed systems in hydrogen become physico-chemical basis of SHS processes in metal-hydrogen systems and led to the technological works with significant industrial prospects.

A) ***The high-performance technological processes of synthesis of various hydrides were developed which have not analogues in the world.*** Today they can provide synthesis and production of a large range of inexpensive high quality hydrides. **The most promising for hydride synthesis SHS method has significant advantages over of all the known methods, such as:**

- high productivity; effective one-stage process
- high quality hydrides and wastelessness (100% yield);
- practically without energy consumption
- The environmentally pure and safe process
- simplicity of technological cycle and equipment
- use of inexpensive raw materials: sponge. chips - mechanical processing waste of refractory metals; hydrogen of electrolytic purity;
- high dispersibility of the obtained hydrides to micron;
- submicron sizes, nanoscale sizes of crystallites in powder grains
- SHS method of hydrides synthesis eliminates a number of laborious operations demanded in the traditional methods, such as: pre-activation of source metal, deep purification of hydrogen, using of finely dispersed powders of metals and alloys.

B) **Among the technological processes developed in the Laboratory and introduced in the industry it should be noted:**

- **The SHS-technology of molybdenum disilicide ($MoSi_2$) production** (40 tons per year), introduced at the high-temperature heaters plant in Kirovakan (Vanadzor), which received the highest award at the Leipzig Trade Fair. The team of scientists and industrialists, authors of this development, received the ***State Prize of Armenian SSR for Science and Technology in 1980***
- **SHS-technology of synthesis of titanium and zirconium hydrides used in 1980-1990** for manufacturing at the experimental section of the Institute and the pilot plant "Armniytsvetmet" of over than 20 tons of hydrides for the needs of the defense industry.

C) **The previously unknown "hydride cycle" (HC) method**, in which SHS synthesized hydrides are used as the starting metals, is very promising for the production of refractory alloys and transition metal intermetallics. **More than 100 refractory alloys and intermetallics of transition metals have been synthesized. The main advantages of HC compared** with the traditional methods (induction and arc melting, etc.) presented in linc 4.

D) In HC, Ti_2AlN, Ti_3AlC_2, $Ti_{0.9}Nb_{0.1}C_{0.4}Al_{0.5}$, $Ti_{0.8}Nb_{0.2}C_{0.4}Al_{0.5}$ MAX-phases were synthesized. (linc 5)