



## **Research school**

### **“Welding technology and metallurgical processes of arc welding and deposition”**

**School director:** Volodymyr Prokhorenko, DSc, professor

### **Brief description**

#### **History of school**

The school was founded by academician of the Academy of Sciences of Soviet Union K. Khrenov and Dr. V. Dyatlov in 1946

#### **Field of study**

Research of arc and metallurgical processes of welding and deposition, development of welding and deposition technologies and filler materials

#### **School founders**

Academician of the Academy of Sciences of Soviet Union K. Khrenov and Dr. V. Dyatlov

#### **School staff**

**L. Zhdanov**, cand. of technical sciences, associated prof.:

- research of gas phase in SAW process;
- development of new fluxes and flux-cored wires for welding and deposition;
- research of slag systems consisting of minerals typical for the territory of Ukraine;
- PC application for control of AC arc current;
- study of AC arc features

**V. Kotyk**, cand. of technical sciences, associated prof.:

- study of porosity mechanisms;
- study of AC arc features;
- study of weld material liability to cracking;
- improvement of effectiveness of AC arc use in welding and deposition



**A. Slivinskiy**, cand. of technical sciences, associated prof.:

- study of weld material liability to cracking;
- study of AC arc features

**V. Prokhorov**, cand. of technical sciences, associated prof.:

- development of new fluxes and flux-cored wires for welding and deposition;
- research of slag systems consisting of minerals typical for the territory of Ukraine

**I. Korinets**, cand. of technical sciences, associated prof.:

- simulation and development of welding and deposition technological processes

**O. Gayevskiy**, cand. of technical sciences, associated prof.:

- study of physical-chemical factors of weld material liability to porosity

**S. Getmanets**, cand. of technical sciences, associated prof.:

- study of electrode metal transfer;
- study of temperature of droplets and welding pool

**V. Boyko**:

- study of properties of surfaces of metal and slag

**V. Kopersak**:

- study of physical and chemical properties of slag

### **General fields of study**

- ü theory and technology of arc welding processes
- ü analysis of gas phase in SAW process
- ü research of slag systems consisting of minerals typical for the territory of Ukraine
- ü development of new fluxes and flux-cored wires for welding and deposition
- ü study of weld material liability to cracking
- ü PC application for control of AC arc current
- ü study of AC arc features
- ü improvement of effectiveness of AC arc use in welding and deposition



- ü simulation of processes of electrode melting and metal transfer
- ü simulation and analysis of arc welding processes

### **Research results**

- ü ceramic fluxes for welding and deposition (1947 – 1970)
- ü theory of electrode metal transfer (1957) and technological experiments (1992)
- ü mean temperature of welding pool: theory and technological experiments (1959 – 1985)
- ü condenser energy-storage resistance welding (1948 – 1963)
- ü channel model of welding arc, constricted arc, principles of constricted arc formation (since 1946)
- ü magnetic control of welding arc, pinch-effect (1948 – 1963)
- ü 475° C – brittleness of corrosion-resistant steels (1953 – 1965)
- ü adsorptive brittleness of welded joints of dissimilar metals (1969 – 1998)
- ü gas effect on weld properties, welding with nitrogen as protective gas, welding without gas protection (1960 – 1995)
- ü porosity mechanisms (1969 – 1990)
- ü fluorine-free sintered fluxes (since 1985)
- ü physical and chemical slag properties, mechanisms of slag-gas-metal interaction (since 1960)

World industry uses more than 50 types of ceramic fluxes, over 10 types of condenser energy-storage resistance welding machines, fluxes are produced according to technology developed in KPI. 5 tons of AH-44 flux for general use are produced annually.

### **Additional information**

#### **Monographs, textbooks, tutorials**

- ü “Термодинаміка та теплові процеси при зварюванні” (author – V. Kopersak)
- ü “Теорія зварювальних процесів” (author – V. Kopersak)

#### **Scientific degrees**

- ü doctors of sciences: 6
- ü candidates of sciences: 35



## Articles

Number of publications in latter 5 years: 19

## Patents, licenses

- ü Патент України 29733 А “Спосіб оцінки схильності металу шва до утворення тріщин”/ Сливінский А. М., Жданов Л. А., Жданов І. М., Котик В. Т. опубл. Офіційний бюлетень “Промислова власність” №6-11 15.11.2000
- ü А. С. № 1606297 «Флюс для электродуговой сварки и наплавки» А. М. Сливинский, Л. А. Жданов, В. Т. Котик, В. И. Прохоров, Г. А. Кирилюк, В. В. Бартюк, В. И. Галинич. Опубл. 15.11.90. Бюл. № 42
- ü А. С. № 1754377 «Сварочный плавный флюс» А. М. Сливинский, Г. А. Кирилюк, Л. А. Жданов, В. В. Бартюк, В. И. Прохоров, В. Т. Котик, В. И. Галинич. Опубл. 15.08.92. Бюл. № 30

## Scientific school results in higher education

Results of school research are used in undergraduate and postgraduate courses in the field of study “welding” for qualification levels of bachelor, specialist and master.

Scientific school development resulted in foundation of new specialities: “Electrothermal Industrial Systems” (founded in 1966, now it is known as “Welding Industrial Systems” speciality) and “Technology of Production of Welding Materials” (1969 – 1991). In 1989 another speciality “Technology and Equipment of Restoration and Wear Resistance Increase of Machines and Constructions” was founded.