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Paper

JET-FORMING NOZZLES MADE OF DIAMOND POLYCRYSTALS FOR GAS- AND FLUID-ABRASIVE CUTTING AND PROCESSING TOOLS

N.I.Polushin
National University of Science and Technology
"Moscow Institute of Steel and Alloys" (MISIS)

ABSTRACT

Diamond get-forming nozzles are becoming more and more topical due to the increasing working pressure of the industrial hydro-jet tools. The use of diamond polycrystals is limited by their high price. We use several types of diamond polycrystals developed in our laboratory to produce these nozzles.

Several types of diamond polycrystals with the unique wear resistance to abrasive wear have been developed and are produced at the Super hard materials laboratory of MISIS.

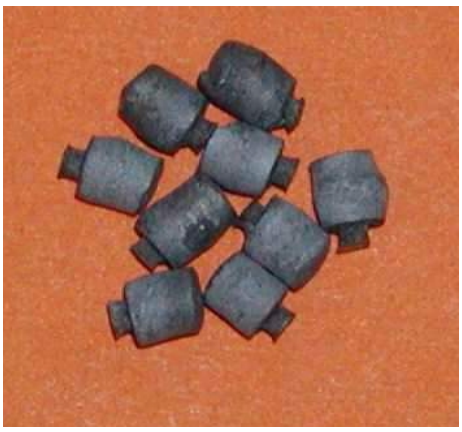

Fig.1 Diamond polycrystals STM95C

Fig.2. Diamond polycrystals STM75C

Two types of diamond polycrystals are shown in figures 1 and 2. Fig.1 shows the STM95C polycrystals produced by the synthesis of graphite. The polycrystals have the following dimensions: Ø 4-5mm; height 3-4mm. Fig.2 shows the STM75C polycrystals produced by the method of diamond powder impregnation with the binding melt. The polycrystals have the following dimensions: Ø 4-8mm; height 4-7mm. The maximum size of the nozzles is conditional on the polycrystals dimensions.

Blanks for the nozzles are obtained after the polycrystals processing with the diamond grinding. The blanks for the nozzles are shown in Fig3.

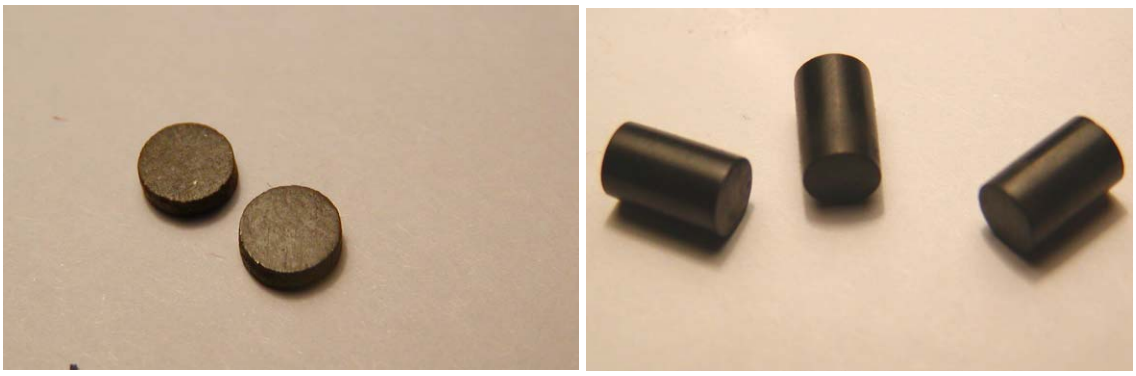

Fig.3. Various types of diamond polycrystalline blanks for the nozzles

The structure of the diamond polycrystals produced by the method of the synthesis of graphite (Fig.4) is more fine-grained than the structure of the polycrystals obtained by the method of impregnation (Fig.5).

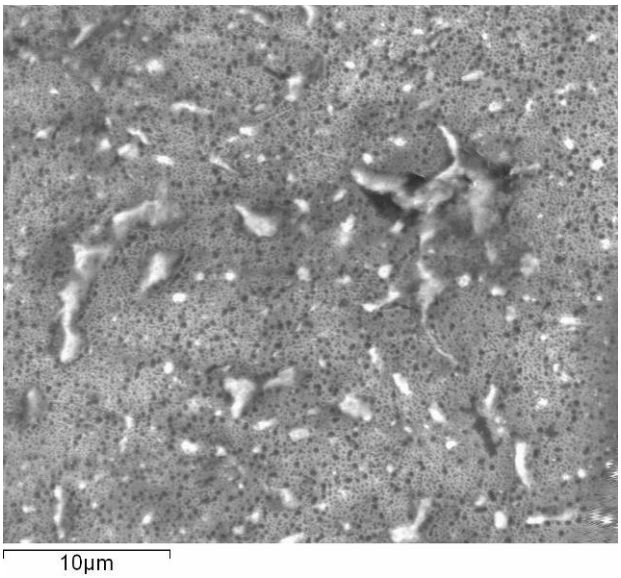

Fig.4. Microstructure of STM95C

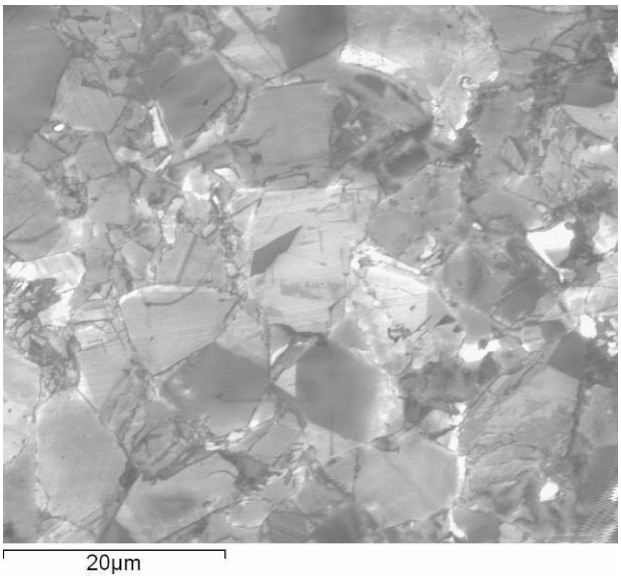

Fig.5. Microstructure of STM75C

The abrasion capacity was used as the major characteristic showing the wear resistance of the materials for nozzles. A specialized installation is used to detect this characteristic. The characteristic shows the wear of the abrasive disc of the certain type (in sm^3) when using 1mg of the nozzles' material. The abrasive capacity of various materials applicable for nozzles manufacturing is shown in Table 1.

Table 1. The abrasive capacity of various materials for nozzles manufacturing

##	Type of the material tested	Abrasive capacity, sm^3/mg
1	STM95C	24.6
2	STM75C	16.2
3	Corundum	1.2
4	Sapphire	1.1
5	Hard alloy VK6	0.,2

An up-to-date laser installation is used for nozzles production, the jet-forming bore goes through grinding and polishing.

Fig.6. Laser installation for nozzles production

Various types of jet-forming nozzles are shown in Fig.7.

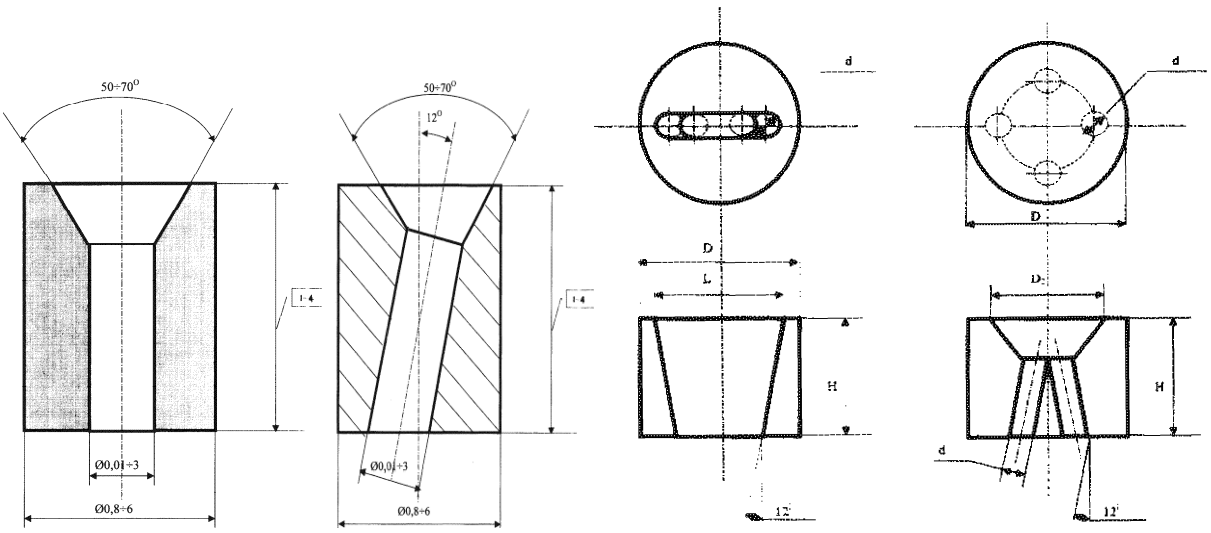

Fig.7. Various modifications of the nozzles

Diamond nozzles without a case are shown in Fig.8. A diamond nozzle in the case is shown in Fig.9.

Fig.8. Diamond nozzles without a case

Fig.9. Diamond nozzles in the case

Diamond elements of locking equipment are shown in Fig.10.

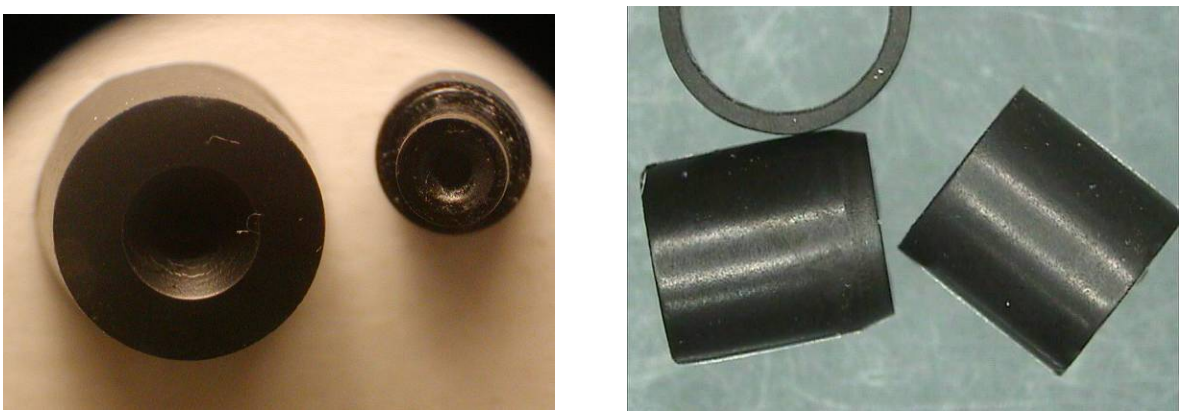

Fig.10. Elements of locking equipment made of diamond polycrystals