Fig. 1. The main types of devices for growing diamond single crystals at high pressure and temperature: a) 6-punch high-pressure equipment (China); b) belt-type device (USA, South Africa, Ireland); c) toroid-type device (designed by the Institute of Superhard Materials of the NAS of Ukraine); d) Bars device (designed by the Institute of Geology and Geochemistry of Minerals, the RAS)

Fig. 2. General view of single crystals of Ib (a) and IIa (b) types after growing in the metal solvent and after etching by chemical method
Fig. 3. Samples of single crystals of Ib type (weight 2–3.5 ct) (a) and IIa type (weight 0.7–1.3 ct) (b)

Fig. 4. General view of diamond single crystals of Ib type grown on crystal seed in the system Fe-Al-B-C (weight 2.0–2.5 ct)

Fig. 5. 6-punch press CS-VII (plunger diameter: 560 mm, load: 25 MN): 1) 6-plunger stand, size: 3.4 × 3.4 × 3.7 m; 2) hydraulic pump unit; 3) hydraulic system control unit with oil tank; 4) electronic controller of heating and growth cell load parameters
Fig. 6. General view of shop for the production of diamonds (equipped with 6-punch press CS-VII with a plunger diameter of 560 mm and load of 25 MN)

Fig. 7. Development of growth cells for 6-punch press CS-VII with a reaction volume of 20 cm³: a) general scheme of container loading in the machine; b) temperature distribution for spontaneous crystallization of diamond; c) temperature distribution for the temperature gradient method
Fig. 8. General view of structurally perfect diamond single crystals of various types obtained by the temperature gradient method from crystal seeds in 6-punch AVT: a) Ib type, b) IIa type, c) IIb type. Left: solvent with grown crystals; right: general view of crystals after etching from the solvent.