Large Diamond Morphology of Catoca Pipe(NE of Angola)

/ ZINCHENKO VLADIMIR (*)

(*) SMC CATOCA Ltd. Mining Company and Russian Mineralogical Society.Gagarinskaya av. 14, ap.116.191028,St-Petersburg (Russia)

INTRODUCTION.

The Catoca pipe is a part of the one of the major deposits of the world and is marked by the high rate of recovery of the relatively bulky diamonds (of +5GR size group), comprising 15,6% of their total recovery (Zinchenko, 2005, 2008). Extra bulky diamonds of the special size +10,8cts (in accordance with the CSO De Beers classification) were formerly examined in limited quantity (Zinchenko, 2009). The morphological and mineralogical data of this category of diamond crystals are published quite infrequently, due to their natural rarity and the limited access of the researchers to them. Meanwhile, they are important for the process of crystallization and the concentration of these diamonds in kimberlites. The morphology of the bulky diamonds of the Catoca kimberlite are presented here.

DATA AND METHOD.

The crystals from two collections of extra-bulky diamonds of the Catoca pipe are examined without exception: 132 and 163 crystals of the special size group of +10,8 cts (conventional sieve class +14,09mm). The morphology of the bulky crystals was examined on the ground of the well-known diamond classification of Orlov (Orlov, 1977), and was supported by the photo-registration of the morphological and mineralogical features of crystals. The weighting precision was within 0,1% (weight percentage). Mineralogical and morphological features of the bulky diamonds of the special size group (1st) are compared to the features of the diamonds of sizing group -9ct+2GR, class -11,20+6,35mm (2nd) (Tab.1).

MORPHOLOGY.

The extra-bulky diamond crystals of the Catoca pipe of the 1st special size group of +10,8 cts are different from the minor crystals of the compared 2nd size group-9ct+2GR (Tab.1). They are classified as section 1 (Tab.1). The quotient of crystals of the variety I (Fig.1a,b,c) among the bulky diamonds of the 1st group is lower than the smaller diamonds of the 2nd group (70,3 wt % and 82,5 wt %, respectively). The yellow cubes of the variety II are observed only among bulky crystals (1,0%). The quotients of the gray translucent cubes of the variety III (Fig.1d,e) are 4,6% and 8,1%, respectively. Coated crystals of the variety IV and deep-brown rombododecahedrons of the variety V are not observed. Irregular crystalline accretions of the variety VII (Fig.1f) among bulky diamonds are average of 8,8%, and are lower than the 2ndgroup (5,8%). The quotients of the clearly crystalline boart variety VIII, (Fig.1g) are of 2,8% and 1,7%. The quotient of the fine crystalline boart variety IX, (Fig. 1h) is closer to the diamonds of the 1st group (8,6%) than to the 2nd(0,6%). Bolas-like (variety VI) and carbonado-like (varieties X and XI) polycrystalline aggregates are not observed.

Morphological varieties, crystal habit and twins , after Orlov (1977)	1st size group from Plant-1,%			2nd size group from Plant-2,%
	+10,8ct +14,09mm 132 crystals	+10,8ct +14,09mm 163 crystals	Average, %	-9ct+2GR -11,20+6,35mm 295 crystals
1.Morphological varieties:				
I – octahedrons (O)+ rhombododecahedrons (R) + transitional (OR)	77,6	62,9	70,3	82,5
II – yellow cubes	1,0	1,0	1,0	0,0
III – gray cubes	4,9	4,3	4,6	8,1
IV – "coated" crystals	0,0	0,0	0,0	0,0
V – black R	0,0	0,0	0,0	0,0
VII – irregular crystalline accretions	5,4	12,1	8,8	5,8
VIII – clearly crystalline boart	0,4	5,2	2,8	1,7
IX – fine crystalline boart	10,2	7,1	8,6	0,6
2. Monocrystal's habit:				
Octahedral	40,7	32,2	36,4	33,3
Transitional	18,4	3,1	10,8	15,7
Rhombic dodecahedral	2,3	7,5	4,9	10,4
Cubic	4,8	5,3	5,0	3,3
Tetrahexahedral	1,1	0,0	0,6	4,1
Uncertain (fragments)	0,5	0,0	0,2	1,3
3. Crystal twins (I variety):				
Contact twins+ parallel accretions	6,6	14,7	10,7	14,2
Spinel twins	9,6	5,4	7,5	8,9

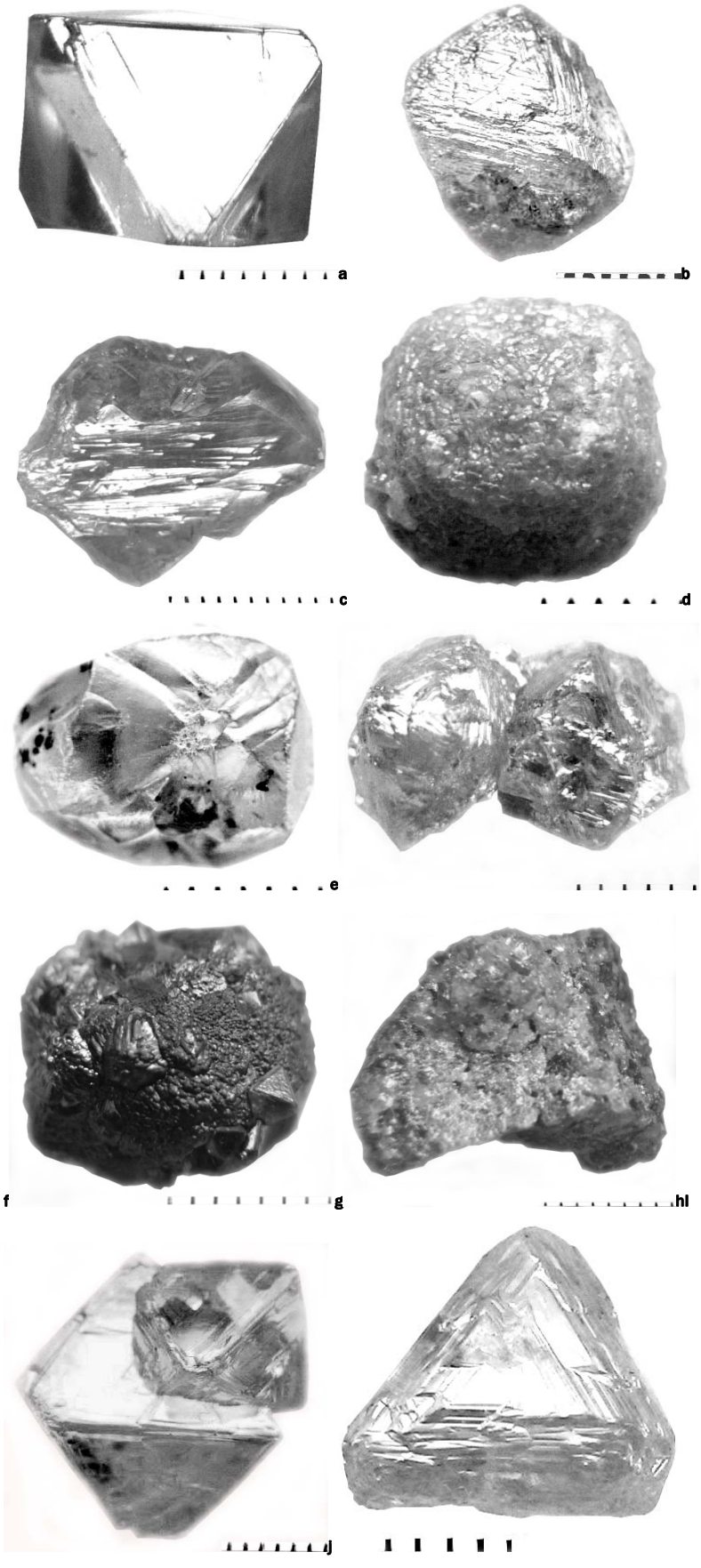
Table 1.*Morphology of large diamond crystals from Catoca pipe for two size groups.*

The habit types of diamond crystals are shown in section 2 (Table 1). The quotients of octahedrons (Fig.1a) of both groups are nearly the same, 36,4% and 33,3%, respectively. The quotient of crystals of the transitional habit (Fig.1b) is 1,5 times lower amongthe bulky diamonds (10,8%) than among the 2nd group of diamonds(15,7%). The same balance is typical for rhombic

palabras clave: Diamante, Cristal,Morfologia, Kimberlita, Grupo de tamaño, Quilate (ct), Grano (GR).

key words: Diamond, Crystal, Morphology, Kimberlite, Sizing group, Carat (ct), Grainer (GR).

* corresponding author: **vladimir.zin@mail.ru**



dodecahedral crystals (4,9% and 10,4%, respectively, Fig.1c). The quotient of the cubic crystals (Fig.1d) is higher among bulky diamonds (5,0%), than among the of the 2nd group diamonds (3,3%), whilst the correlation is inverse in the compared groups of tetrahexahedral crystals (Fig.1e) (0,6% and 4,1%). The crystal twins and accretions (section 3, Tab.1) on the whole pertain to variety I, and they dominate in the 2nd group.

CONCLUSION.

Morphological and mineralogical studies of the bulky diamonds from the kimberlites allow to establishing specific features of their ontogenesis and morphogenesis. They also help to adjust their quality and the value of the economical potential of the deposit of these rare unique stones, the cost of which runs to 1 Million USD for 1 specimen.

GRATITUDE.

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***Fig 1** .Morphological varieties and habit types of diamond cristals and twins of Catoca pipe: a – octahedral , b - transitional, c – rombic dodecahedral crystalls of the variety I; d – cubic and e –tetrahexahedral crystalls of the variety III; f - Irregular crystalline accretions of the variety VII; g –clearly crystallineboard, variety VIII; h – fine crystalline board, variety IX; i - contact twin; j – spinel twin. Ruler divisions are equal of 1 mm.*