PERSPECTIVES OF INFORMATION – INTELLECTUAL TECHNOLOGY FOR MONOCRYSTAL GROWTH

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The increasing of computer control system functional efficiency of scintillate monocrystals technological growth by Bridgman-Stockbarger is based on providing high requirements to its optical characteristics The typical automate control system does not provide necessary flexibility and adaptiveness of technological process. Besides, there isn't any problem of intellectual constituent. Its solution can decrease human resource and enhance efficiency of a system. All these reasons cause search of new modern ways to control growth technological process.

One of the possible methods is an intellectual information-extreme technology (IIET), which is based on maximizing the information capacity of the Decision Support System in the learning mode. It has been already used in the control system of chemical production (PSC Sumykhimprom, Ukraine) and has demonstrated good results.

Let's analyse the opportunity to use this method for monocrystal growth by Bridgman-Stockbarger. The main idea of IIET is to form learning matrixes <object - property> and maximize information content in learning mode with additional informational

limitations. Each matrix describes some functional state of the technological process.

The method of monocrystal growth had been developed by Bridgman-Stockbarger before the learning matrixes were formed. It comprises the case with insulation and the heater winding, heaters and moving quartz ampoule with liquid in it. Usually the ampoule is of the cylindrical shape with a conical lower end for better start monocrystal formation. The ampoule is slowly placed into a cooler position in the interface between crystals. The liquid is always of the same temperature and as a result a crystal starts to grow in the conical tip. The speed of the ampoule also depends on the temperature and the material. The method of monocrystal growth is good for materials with low melting point and sensitive to air.

So it is possible to form learning matrixes with the next recognition attributes: heater temperature, melt level, heater capacity, ampoule speed, cooling water temperature etc. This makes possible to form alphabet of three recognition classes for future classification and optimization. It is known as IIET functional parameters structured vector $g = < x_m, d_m, \delta, \rho >$, x_m – reference binary class vector realization $X_m^o(\tau_r)$, d_m – radius of class container $X_m^o(\tau_r)$, δ – acceptance tolerance parameter for recognition attributes, ρ – selection level. And the task is to define optimal coordinates, where g is vector to provide maximum of aggregate functional efficiency criteria (FEC).

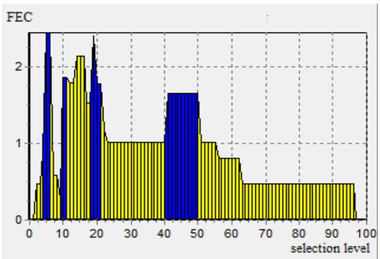

Figure 1 Cross-plot of KFE and selection level.

Figure 1-1 shows the dependence of KFE of the selection level after parallel optimization with the acceptance of tolerance parameter $\delta = 85$. The darker section is the effective range of criteria. The optimal value of ρ is 5, but more steady mode is 40-50.

It has been worked out to use IIE technology in growth control and to find optimal coordinates for IIET vector.

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