THE PROCESS OF FORMATION OF OPTICAL FIBERS AS OBJECTS OF STUDY

Alexey Zinkevych, Alexander Neshchadym, Volodymyr Safonov.

The instability of the external conditions of formation can lead to loss hydrodynamic stability of the process of formation of fibers or to the edge of the glassmass was ejected. The movement of liquid consider hydrodynamically stable, if small perturbations acting on the system reach a certain equilibrium state or reduced to zero, and does not increase with time. If not, then the flow stream loses hydrodynamic resistance, causing fluctuations in the geometrical parameters of the finished product and can lead to a complete stop process of forming fibers.

Therefore it is necessary to separate the region stable and unstable formation fibers in space (the plane) changes in external conditions stretching fibers and spinnability region. This can be done on the basis of mathematical models that adequately describes and sustainable process of forming the fibers as deeply as possible.

The formation has two main stages: shaping and fixing form. It is necessary to consider two aspects of the process of formation - mechanical (process of deformation glass mass) and thermo (process heating and cooling glass). If the reference point considered the beginning of melting glass piece, the whole process of formation can be divided into four zones: the formation zone; zone of extraction; completion of the zone; reception area finished fiberglass. Each zone correspond to the characteristics of the flow of these two sides of the process of formation.

Each of these four zones characterized by the type of relationship between stress τ and consequent deformation Δ and strain rates. Installing the nature of these dependencies $\tau = \tau(\Delta)$ are called constitutive equations is the responsibility of rheology. To fully understand the process of formation need to know rheological behavior of fiber extracted in each of the four zones.

However, it is impossible for the present state of our knowledge, to date there is no reliable, exactly accurate or comprehensive general theory of experimental data

for such a wide range of environmental conditions. And as a result, have limited the use of simple rheological models and suitable empirical relationships.

Analysis of the influence of external conditions formation (feed rate of the workpiece in the oven, pulling speed, ambient temperature, the temperature of the furnace, the heat transfer coefficient, heterogeneity geometric dimensions of the workpiece along its length) on the parameters of the finished product was made in the article.

The notion areas hydrodynamic stability and spinnability, their relationship and their impact on the characteristics of the finished product.

Analysis stages the formation zone was made: shaping and fixing form.

Characteristic features of the flow of mechanical and thermo-side the formation zone for each of the zones the formation zone process were analyzed. Classification of fiber-melt rheological point of view was held. Conclusions: The instability of the external conditions of formation can lead to loss of hydrodynamic stability of the process of pulling fibers.

Region hydrodynamic stability does not always coincide with the area spinnability. Region pryadomisti includes that part of the field of hydrodynamic stability, which can cause brittle rupture, and that part of the field of hydrodynamic instability in which the growth of capillary waves on the free surface of the liquid jet still does not collapse into droplets.

Terms "stay" in the stable the formation zone is not sufficient, as it may cause brittle rupture, which operates independently of hydrodynamic stability. At each stage of the formation zone should consider two aspects: mechanical and thermo.

There is no complete mathematical model of fibers in the classical theory. Each formation zone is characterized by own type relationship between stress and deformation caused by it.

There is no general theory for a wide range of environmental conditions. Arrangement of rheological models should be done in the classical theory relying on basic models of continuous medium.