

The SibFU researches created a diamond based device

The researchers of SibFU and Technological Institute for Superhard and Novel Carbon Materials created acoustoelectric device — piezoelectric laminated structure based on diamond synthetic monocrystal and aluminum nitride wrap with operating frequency range from 1 to 20 GHz.



The researchers identified optimal piezoelectric structure with the help of experiments and modelling so that High-overtone Bulk Acoustic Resonator (HBAR) possesses high quality factor and works more effective. So, with the frequency of 20 GHz there is the highest quality factor ~ 12500. Before this moment the operating frequency range in similar devices did not exceed 10 GHz.

"Synthetic diamond monocrystal of a IIa type demonstrated great acoustic parameters as a substrate in all range of studied frequency and can be successfully used in development of different acoustoelectric devices, especially that work in the range of super high frequency (SHF)," — says the paper about the results of this study in July magazine edition "Ultrasonic".

In creation of the acoustoelectric device the researchers used volumetric acoustic waves. They have higher values of phase velocities and at the same time a smaller attenuation in comparison with surface acoustic waves, which are now traditionally used in similar devices.

The new piezoelectric layered structure based on diamond can be useful for creating miniature and reliable acoustoelectric devices on the base of hypersonic acoustic waves — for example, for radar and radioelectronic signal processing systems, and serve as a basis for creating a whole class of highly sensitive sensors of various physical impacts (temperature, force, acceleration, high pressures) and biological micro objects.

29 december 2017

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