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### **Dynamic characteristics of the light emission, accompanying the cryocondensation of some gases**

Processes of thin films cryovacuum condensates of different gases, as well as their properties are the object of attention of researchers for more than a decade.

Previously, we conducted studies in which it was found interesting behavior of nitrous oxide in the process of condensation and thermal cycling of the condensed sample.

**Key words:** Cryovacuum condensates, cryoemission, phase transformations, nitrous oxide.

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### **Динамические характеристики излучения света, сопровождающего процесс криоконденсации некоторых газов**

Процессы в тонких пленках криовакуумных конденсатов различных газов и их свойства являются объектом исследования многих ученых более десяти лет. В процессе изучения динамических характеристик фазового превращения газ – твердое вещество было обнаружено, что процессу конденсации закиси азота на металлической подложке сопутствует излучение света в видимом диапазоне.

**Ключевые слова:** криовакуумные конденсаты, криоизлучение, фазовые превращения, закись азота.

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### **Кейбір газдардың криоконденсация процесімен қатар жүретін жарықтың сәулеленуінің динамикалық сипаттамалары**

Әртүрлі газдардың криовакуумді конденсаттарындағы жұқа қабықшалардағы процестер және олардың қасиеттері ондаған жылдам аса уақыт бойы көптеген ғалымдардың зерттеу нысаны болып келеді. Газ – қатты зат фазалық ауысуының динамикалық сипаттамаларын зерттеу процесінде металл төсемеде азот тотығының конденсация процесіне көрінетін диапазонда жарық сәулеленуі қатар жүретіні анықталды.

**Түйін сөздер:** криовакуумды конденсаттар, криосәулелену, фазалық ауысулар, азот тотығы.

Processes of thin films cryovacuum condensates of different gases, as well as their properties are the object of attention of researchers for more than a decade.

Previously, we conducted studies in which it was found interesting behavior of nitrous oxide in the process of condensation and thermal cycling of the condensed sample. In the course of studying the dynamic characteristics of the phase transformations gas-solid, it was found that the condensation of nitrous oxide into the metal substrate is

accompanied by the emission of light in the visible spectrum.

In these studies, we report our new results in the study cryoradiation accompanying the condensation of some gas. The main objectives of this research is: (a) – check a broader range of substances for their ability to cryoradiation; (b) – the study of the nature of radiation and its relaxation characteristics; (c) – the study of thermally stimulated processes in condensed samples. Studies have been carried on the installation and according to the procedure

previously described by us in detail. The main unit of the installation is a cylindrical vacuum chamber with diameter and height of 450 mm. The ultimate vacuum in the chamber is reached a value better than  $P = 10^{-8}$  Tor. The condensation pressure is adjusted to  $P = (10^{-4} - 10^{-2})$  Tor. In the center of the chamber, a cryogenic system of Gifford-Mc Mahon is mounted, on the top flange of which a metal substrate, which serves as the condensation surface, is mounted. Diameter of the substrate  $d=60$  mm. The condensing temperature  $T = 16$  K. The temperature measurement was carried out with silicon sensor DT 670-1.4 using a temperature controller M335/20s.

Intensity of radiation was measured by photomultiplier tubes P25a-SS-0-100 with a frequency  $10^5$  times per second.

When selecting the working substances, we proceeded from the assumption of the possible role of intrinsic dipole moment of the molecule to create the conditions for emergence of cryoradiation. Therefore we investigated dipole molecules (nitrous oxide, water, ethanol), and molecules with zero intrinsic dipole moment (nitrogen, carbon dioxide, argon). The experimental results are subject to detailed analysis and discussion of the assumptions and conclusions.