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АВТОКОЛИВАННЯ У КРИСТАЛІЧНОМУ МЕТАНІ ПРИ ОПРОМІНЕННІ ЕЛЕКТРОНАМИ

Проведено математичне моделювання та експериментальне дослідження процесів утворення автоколивань температури та концентрації радикалів у плівці метану, що опромінюється електронами за низьких температур. Автоколивання обумовлені активаційним характером дифузії та процесами рекомбінації радикалів. Автоколивання вивчаються експериментально вимірюванням десорбції частинок з опромінюваного зразка і теоретично розв'язуванням кінетичних рівнянь для дефектів у зразку метану. Спостережено й досліджено автоколивання двох типів частинок, а саме атомів водню і радикала CH_3, що формуються при опроміненні метану електронами. Показано, що зі збільшенням інтенсивності опромінення період осциляцій зменшується і його розраховане значення має порядок, спостережуваний в експерименті. Представлено модель прояву автоколивань концентрації молекул водню під час десорбції.

Ключові слова: метан, електронне опромінення, автоколивання, температура, дефекти.

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SELF-OSCILLATIONS IN SOLID METHANE IRRADIATED BY ELECTRONS

The formation of self-oscillations of temperature and concentration of radicals in an electron-irradiated methane film at low temperatures has been investigated experimentally and theoretically. Self-oscillations arise due to the activation nature of diffusion and radical recombination processes. Self-oscillations were studied experimentally by measuring the desorption of particles from an irradiated sample and theoretically by solving the kinetic equations for defects in a methane sample. Concentration self-oscillations of two types of particles have been found and investigated; namely, hydrogen atoms and CH_3 radicals formed during the irradiation of methane by electrons. It is shown that with an increase in the irradiation intensity, the oscillation periods decrease, and the calculation value are of the order of magnitude observed in the experiment. A model of a manifestation of the self-oscillation of hydrogen molecule concentration during desorption is presented.

Keywords: methane, electron irradiation, self-oscillations, temperature, defects.

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