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Kuiper belt objects: formation, thermal evolution and radioactive nuclides

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The study has been made of the radionuclide impact on the thermal evolution and structural stability of Kuiper Belt objects (KBO) during the process of their formation from the protoplanet cloud fringe region material at the early stage of the solar system creation. The main mechanism of the body formation has been assumed to be the accretion of small dust particles trapped by a dynamically changing gravity field of the growing body with simultaneous condensation of H2O vapour molecules. In this way a spherically symmetric body was being created which material is a two-component disperse system consisted of a cemented mass of hard dust particles and voids partially or fully filled with H2O ice. The ice component specific content was defined by H2O phase changes caused by temperature variations. It has also been assumed that the main source internal layer heating was the short-living radioactive nuclide 26Al introduced into the body matter as a part of the accretion material. The nuclide radioactive decay and energy release peculiarities have been taken into account. The thermal and structural evolution during the formation time of some KBOs has been studied for different growth times, celestial body sizes, accretive material content including the presence of long-living radionuclides 238U, 232Th, 40K with an account of their radioactive decay and energy release mechanisms. The space-time distribution of the temperature field in the created celestial body material has been obtained.