The inverse problem in the theory of degenerate dwarfs in the frame of two-phase model

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Last two decades yielded the observations of degenerate dwarfs which revealed the variety of their characteristics and as result a problem of correct inner structure description appeared.

We propose the two-phase model which describes the dwarfs with different core temperatures (degeneration extent of an electron gas), in particular "hot" white dwarfs with luminosities that exceed that of the Sun. The inner part of white dwarf is considered as two-component metallic system which consists of partly degenerate ideal relativistic electron gas and nondegenerate static nuclear subsystem (continuous classical medium). The surface layer is considered as nondegenerate gas envelope. The equation of state in the Lane-Emden politrope form was obtained for this region using approximate solution of the equations of stellar structure. The equation of the hydrostatic support in the inner part of a star can be rewritten as an equation for the local chemical potential and the point where it becomes zero defines a core radius. In the surface layer we use an equation for local temperature. Our model contains the next parameters: relativistic parameter in the stellar centre $x_0 = (3\pi^2 n_0)^{1/3}\hbar/m_0 c$ (n_0 – electron concentration), isothermal core temperature T_0 and parameter of averaged chemical composition $\mu_e =< A/Z >$.

The local density and temperature dependences on a radial coordinate were calculated. The expressions for mass and radius of both core as well as surface layer of a dwarf were obtained as the functions of the model parameters. The full energy dependence of a core and a surface layer on parameters x_0, T_0 was calculated. The parameters of the model for a large number of DA white dwarfs were found using their masses, radii and effective temperatures. It was shown that the observed white dwarfs' distributions by masses and radii are well consistent with energy dependence on these characteristics.