Method for synthesizing core-shell semiconductor colloidal quantum dots involves preparing semiconductor core nanocrystals in colloidal solution and subsequently growing semiconductor shell via heteroepitaxy on the surface of formed core nanocrystals. During the nucleation and initial growth stages of core nanocrystals, colloidal solution is subjected to ultrasonic treatment at a frequency of 20-50 kHz and a specific power of 0.5-5 W/cm², after the formation of core nanocrystals is complete, the ultrasonic treatment is stopped, and during the stage of heteroepitaxial growth of semiconductor shell in colloidal solution, an external hydrostatic pressure in the range of 10-100 MPa is applied at a temperature of 400-450 K, wherein such a magnitude of the hydrostatic pressure is selected that it suppresses homogeneous nucleation of semiconductor shell material in colloidal solution and ensures heteroepitaxial growth of shell on the surface of core nanocrystals.