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**Acoustic nonlinear periodic waves in pair-ion plasmas** SHAHZAD MAHMOOD, PINSTECH, Islamabad, TAMAZ KALADZE, Govt. College Lahore, HAFEEZ UR-REHMAN, PINSTECH, Islamabad — Electrostatic acoustic nonlinear periodic (cnoidal) waves and solitons are investigated in unmagnetized pair-ion plasmas consisting of same mass and oppositely charged ion species with different temperatures. Using reductive perturbation method and appropriate boundary conditions, the Korteweg-de Vries (KdV) equation is derived. The analytical solutions of both cnoidal wave and soliton solutions are discussed in detail. The phase plane plots of cnoidal and soliton structures are shown. It is found that both compressive and rarefactive cnoidal wave and soliton structures are formed depending on the temperature ratio of positive and negative ions in pair-ion plasmas. In the special case, it is revealed that the amplitude of soliton may become larger than it is allowed by the nonlinear stationary wave theory which is equal to the quantum tunneling by particle through a potential barrier effect. The serious flaws in the earlier published results by Yadav et al., [PRE **52**, 3045 (1995)] and Chawla and Misra [Phys. Plasmas **17**, 102315 (2010)] of studying ion acoustic nonlinear periodic waves are also pointed out.

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