Comment on `Motion of a soliton pair in an inhomogeneous hydrogen-bonded chain'

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COMMENT

Comment on 'Motion of a soliton pair in an inhomogeneous hydrogen-bonded chain'

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Abstract. I point out that the recent paper 'Motion of a soliton pair in an inhomogeneous hydrogen-bonded chain' (J-Z Xu 1995 *J. Phys.: Condens. Matter* **5** 269) is based on my bell-shape soliton model previously published.

Protonic dynamics in hydrogen-bonded solids have attracted considerable interest in recent years due to the taking into account of the real asymmetry of double well-potentials for a proton in hydrogen-bonded chains [1–6]. For example, in [1] the asymmetric double-well potential

$$V = \tfrac{1}{2}Au^2 - \tfrac{1}{3}Bu^3 + \tfrac{1}{4}Cu^4 \tag{1}$$

where $u = u(x, t)$ is the displacement of a proton from one of the minima of the double-well potential (1), has been used for the motion of a soliton pair. Equation (1) has also been used in [4] to calculate the thermodynamic properties of a system of asymmetric double-well anharmonic oscillators and in [6] for calculations of conductivity in proton superconductors. One of the central points of the model (1) [1] is an existence of the exact soliton solution (bell-shaped soliton) for the equation of motion for the potential (1)

$$u = (3A/B)/\left(1 + \left(1 - \left(9AC/2B^2\right)^{1/2}\right)\cosh(s/\Delta)\right) \tag{2}$$

where Δ is the width of the soliton, $s = x - vt$ and v is the soliton velocity in the direction x. For $9AC = B^2$ we have the symmetric double-minimum potential and the kink solution

$$u = (3A/B)\Big/\left(1 + \exp\left(-\frac{s}{\Delta}\right)\right) \tag{3}$$

The model (1) for hydrogen-bonded systems had been proposed in [7, 8]. Equations (2) and (3) had also been obtained in [7, 8]. The kink energy and its effective mass, presented in [1], had been calculated in [8].

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