The modified Pöschl-Teller potential

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April 05, 2024

Abstract

In the present studies, modified Pöschl-Teller potential (MPTP) is constructed from second Pöschl-Teller potential through conditions to be satisfied by a diatomic molecule potential. Expressions for bound state energy eigenvalues and molar entropy are derived for the MPTP. The equations obtained are applied to seven diatomic molecules: 7Li2 (a 3Σu+), Na2 (c 1Πu), CO (X 1Σ+), MgO (X 1Σ+), SO (X 3Σ-), SiO (X 2Σ+), and TiO (X 2Σ+). Numerical data are analyzed using average absolute deviation (AAD) from the dissociation energy and mean absolute deviation (MAD) from the Rydberg-Klein-Rees (RKR) data. The AAD and MAD results show that MPTP is superior over the improved Pöschl-Teller potential, and it is approximately equivalent to the improved Tietz potential for most of the diatomic molecules investigated. Expression of analytical molar entropy of the MPTP accurately predicts molar entropy of gaseous CO molecule with a MAD of 0.1993% from experimental data obtained from the literature.

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