

Two Universal Equations of State for Solids

Jiu-Xun Sun^{a,b}, Qiang Wu^b, Yang Guo^a, and Ling-Cang Cai^b

^a Department of Applied Physics, University of Electronic Science and Technology,
Chengdu 610054, China

^b Laboratory for Shock Wave and Detonation Physics Research, Southwest Institute of Fluid Physics,
Mianyang 621900, China

Reprint requests to J.-X. S.; Fax: 86-28-83200131; E-mail: sjx@uestc.edu.cn

Z. Naturforsch. **65a**, 34–44 (2010); received September 18, 2008 / revised June 11, 2009

In this paper, two equations of state (EOSs) (Sun Jiu-Xun-Morse with parameters $n = 3$ and 4, designated by SMS3 and SMS4) with two parameters are proposed to satisfy four merits proposed previously and give improved results for the cohesive energy. By applying ten typical EOSs to fit experimental compression data of 50 materials, it is shown that the SMS4 EOS gives the best results; the Baonza and Morse EOSs give the second best results; the SMS3 and modified generalized Lennard-Jones (mGLJ) EOSs give the third best results. However, the Baonza and mGLJ EOSs cannot give physically reasonable values of cohesive energy and P-V curves in the expansion region; the SMS3 and SMS4 EOS give fairly good results, and have some advantages over the Baonza and mGLJ EOSs in practical applications.

Key words: Equation of State; High Pressure; Volume Analyticity.

PACS numbers: 05.70.Ce, 62.50.+p