# Phononic band structure analysis of SH waves in nanoscale multilayered

## piezoelectric structures using radial basis function method with imperfect

### interface

# <sup>†</sup>Zhi-zhong Yan<sup>1,2</sup>, Chun-qiu Wei<sup>1,2</sup>, and Chuanzeng Zhang<sup>3</sup>

<sup>1</sup>School of Mathematics and Statistics, Beijing Institute of Technology, Beijing 100081, PR China.
<sup>2</sup>Beijing Key Laboratory on MCAACI, Beijing Institute of Technology, Beijing 100081, China.
<sup>3</sup>Department of Civil Engineering, University of Siegen, Siegen, D-57068, Germany.

†Corresponding author: zzyan@bit.edu.cn

#### Abstract

In this paper, we develop the radial basis functions (RBFs) collocation method to calculate the phononic band structures. The band structures of anti-plane transverse waves, propagating obliquely or perpendicular to nanoscale multilayered piezoelectric composites with consideration of imperfect interface are studied. The feasibility of the present method is tested by comparing the numerical results with those based on the transfer matrix method in the case of perfect interfaces. Additionally, the influences of the imperfect interface on the wave band gaps are investigated by comparing with the perfect interfaces. Meanwhile, the effects of various interface conditions, piezoelectric effect, nanoscale size effect, impedance ratios and incidence angle on the cut-off frequency and the wave propagation behavior are investigated and discussed.

**Keywords:** Band structure, Piezoelectricity, Nanoscale, Radial basis function method, Imperfect interface.