UDC 539.374

Rotational Invariance of Non-Linear Lagrangians of Type-II Micropolar Thermoelastic Continuum

Y. N. Radayev[1], V. A. Kovalev[2]

[1] Institute for Problems in Mechanics of the Russian Academy of Sciences, Russia, 119526, Moscow, pr. Vernadskogo, 101, block 1, radayev@ipmnet.ru, y.radayev@gmail.com

[2] Moscow City Government University of Management Moscow, Russia, 107045, Moscow, Sretenka st., 28, kovalev.kam@gmail.com

The paper contains new results related to extension of the field theoretical approach and its formalism to non-linear coupled micropolar thermoelastic media. A mathematical model of micropolar (MP) type-II (GNII) thermoelastic (TE) continuum is considered. A formulation of the least thermoelastic action principle is discussed. Partial differential equations subsequent to the least action principle are derived. The translational symmetries of non-linear Lagrangians are adopted. Those include an additional symmetry: translations of the thermal displacement. The rotational invariance of the action and corresponding Lagrangian is then studied. For micropolar type-II thermoelastic Lagrangians following the usual procedure independent rotationally invariant functional arguments are obtained. Objective forms of the Lagrangians satisfying the frame indifference principle are given.

Key words: type-II micropolar thermoelasticity, field, extra field, action, Lagrangian, d-vector, invariance, rotation, frame indifference principle, deformation, extra deformation.

References

1. Cosserat E. et F. *Théorie des corps déformables*. Paris, Librairie Scientifique A. Hermann et Fils, 1909, 226 p.
2. Toupin R. A. Theories of Elasticity with Couple-stress. *Arch. Rational Mech. Anal.* 1964, vol. 17, no. 5, pp. 85–112.
3. Sedov L. I. *Vvedenie v mekhaniku sploshnykh sred* [Introduction to Mechanics of Continuos Media]. Moscow, Fizmatgiz, 1962, 284 p. (in Russian).
4. Illyushin A. A. *Mekhanika sploshnykh sred* [Mechanics of Continuos Media]. Moscow, Moscow Univ. Press., 1978, 287 p. (in Russian).
5. Green A. E., Adkins J. E. *Bol'shie uprugie deformatsii i nelineinaia mekhanika sploshnoi sredy* [Large Elastic Deformations and Non-Linear Continuum Mechanics]. Moscow, Mir, 1965, 456 p. (in Russian).
6. Berdichevskii V. L. *Variatsionnye printsipy mekhaniki sploshnoi sredy* [Variational Principles of Mechanics of Continua]. Moscow, Nauka, 1983, 448 p. (in Russian).
7. Kovalev V. A., Radayev Y. N. *Volnovye zadachi teorii polia i termomekhanika* [Wave Problems of Field Theory and Thermomechanics]. Saratov. Saratov Univ. Press., 2010, 328 p. (in Russian).