Contribution ID: **27** Type: **Poster Presentation**

AXIOMATIC SYSTEM OF THERMO-PHYSICS THEORY - A TEACHING MODEL OF THERMODYNAMICS AND STATISTICAL PHYSICS

Tuesday, 2 October 2018 17:04 (1 minute)

As a course of theoretical physics, “thermodynamics and statistical physics” is often complained hard to learn and teach by some university students and teachers in China. To a certain extent it is related to the current knowledge system of the course, in which the macroscopic theory-“thermodynamics” and microscopic theory - “statistical physics” are separated from each other [1,2]. Students usually dull perception of the relation between the macro- and microscopic theories, and sometimes fell the contents multifarious and disorderly.
We reformed the course of “thermodynamics and statistical physics” and constructed a new knowledge system - the axiomatic system for teaching the theory of thermo-physics [3]. The macro- and microscopic theories are fused together and the microscopic theory plays a leading role in the system. The theory starts from an axiom (postulation)——the equal-probability hypothesis——the basic hypothesis of the statistical physics, and is tested and verified well by experiments. The ensemble theory is into the main line throughout the course. The macroscopic laws of thermodynamics are straightforward derived by the equal-probability hypothesis. Thermodynamic potentials for the micro-canonical ensemble, canonical ensemble as well as the grand-canonical ensemble are obtained based on the basic postulation, and the properties of various thermodynamic systems can be easily discussed.
The new system is more reasoned and self-consistent in theory. Its application in teaching “thermodynamics and statistical physics” enables students systematically know statistical physics and clearly understand the relationship between the macro- and microscopic theories. And then they can use the thermo-physics theory flexibly to solve many practical problems.

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[2] Zhi-cheng Wang (2013) Thermodynamics•Statistical physics, 5th ed. China Higher Education Press, Beijing.
[3] Xixia Liang and Shiliang Ban (2008) Statistical Thermodynamics, 2nd ed. China Science Publishing \& Media L

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Session Classification: Poster Session

Track Classification: Track D - Teaching and Learning of Physics Concepts