Single Particle Entropy in Heated Nuclei *

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The thermal motion of single particles represents the largest contribution to level density or entropy in atomic nuclei. Rotational and vibrational motion contribute only $10-15$ % at around 8 MeV of excitation energy in rare earth nuclei. Thus, excited single particles are essential for the description of nuclear thermodynamic properties [1].

In this talk the concept of single particle entropy will be presented. It will be shown that this quantity is approximately extensive (additive) for mid-shell nuclei. Figure 1 demonstrates how the single particle (or hole) in ytterbium nuclei contributes with an entropy of $S_1 \sim 2$ (in units of the Boltzmann's constant k_B) compared to the even-even core [2]. Various applications of single particle entropy in heated nuclei will be discussed.

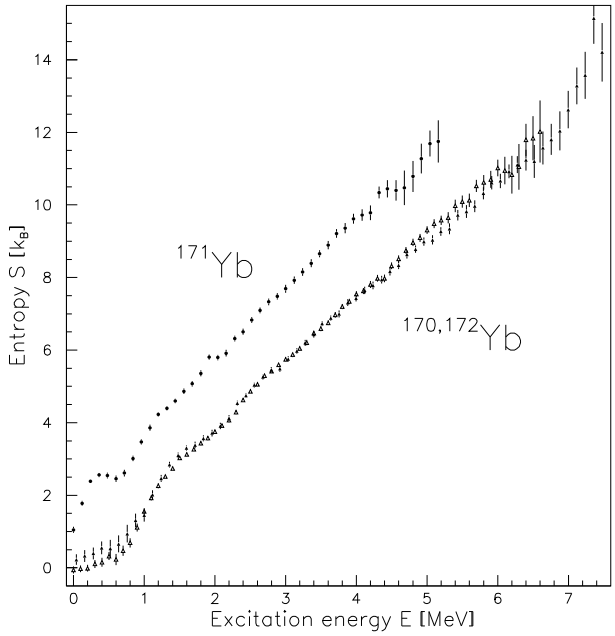

Figure 1: *Experimental entropies for* ^{170,171,172}*Yb deduced from the (*^{3}*He,*α*) reaction. The full circles correspond to* ^{171}*Yb, and full and open triangles correspond to* ^{170}*Yb and* ^{172}*Yb, respectively.*

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[1] M. Guttormsen *et al.*, Phys. Rev. **C63**, 044301 (2001).

[2] U. Agvaanluvsan *et al.*, Phys. Rev. **C70**, 054611 (2004).