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Design of thermoelectrically highly efficient Heusler compounds using phase separations and nano-composites under an economic point of view[1] BENJAMIN BALKE, Johannes Gutenberg-University Mainz — Half-Heusler (HH) compounds are one of the most promising candidates for thermoelectric materials for automotive and industrial waste heat recovery applications. In this talk, I will give an overview about our recent investigations of phase separations in HH thermoelectrics, focusing on the ternary system TiNiSn-ZrNiSn-HfNiSn. I will show how we adapted this knowledge to design a p-type HH compound which exhibits a ZT that is increased by 130% compared to the best published bulk p-type Heusler. I will also present how we used the phase separation to design thermoelectric highly efficient nano-composites of different single-phase materials. Since the price for Hafnium doubled within the last year, our research focused on the design of HH compounds without Hafnium. I will present a very recent calculation on ZT per Euro and efficiency per Euro for various materials followed by our latest very promising results for n-type Heusler compunds without Hafnium resulting in 20 times higher ZT/Euro values. These results strongly underline the importance of phase separations as a powerful tool for designing highly efficient materials for thermoelectric applications that fulfill the industrial demands for a thermoelectric converter.

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Benjamin Balke
Johannes Gutenberg-University Mainz

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