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**SESSION 15: Regenerator / Recuperator  
Investigations**

Paper 15.2

Thursday ORAL Session

11:00 AM

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**Computational Investigation of Idealized  
Heat Capacity Materials for Packed  
Sphere Bed Regenerators in Stirling  
High Frequency 4 Kelvin Cryocoolers  
Operating in the Real Gas Regime**

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The potential for using Porous Wall Hollow Glass Microspheres (PWHGMS) as a low cost, non-magnetic, readily available regenerator matrix for high frequency Stirling type cryocoolers operating down to 3 Kelvin was explored via modeling. Modeled regenerators using packed beds of various rare earth metals (the current state of the art), PWHGMS, and ideal materials (in terms of heat capacity and conductivity) were compared using industry standard modeling tools SAGEv12 and Regen 3.3, as well as with analytic calculations. This paper presents our findings regarding consistency between the tools, analysis and modeling results, and a discussion of their implications, both for the use for PWHGMS and for future research associated with finite heat capacity solids in real gas regenerators.