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Combined Heat Transfer Analysis for all Solid State Cryocooler

Attaining cooling effect by using laser induced anti-Stokes fluorescence in solids appears to have several advantages over conventional mechanical systems and has been the topic of recent analysis and experimental work. Using anti-Stokes fluorescence phenomenon to remove heat from a glass by pumping it with laser light, stands as a pronouncing physical basis for solid state cooling. Cryocooling by fluorescence is a feasible solution for obtaining compactness and reliability. It has a distinct niche in the family of small capacity cryocoolers and is undergoing a revolutionary advance. In pursuit of developing laser induced anti-Stokes fluorescent cryocooler, it was required to develop numerical tools that support the thermal design and therefore a thorough understanding and analysis of combined heat transfer mechanism within the cryocooler was necessary. The paper presents the details of numerical model developed for the cryocooler and the subsequent development of a computer program. The program has been used for the understanding of various heat transfer mechanisms and is being used for thermal design of components for an anti-Stokes fluorescent cryocooler. The results are presented in tabular and graphical forms.

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