

Thermal Properties Calculation using GPU Computing

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Speed of properties calculations is one of the important questions in many applications. The improvement of accuracy, and extensions of the region of validity for fluids properties formulations results in increasing complexity of equations. The latest may decrease the calculation speed. In recent years, progress in CPU performance reduces the time required to calculate the properties of substances. This allows one to solve more and more sophisticated research and design tasks, which, in turn, require the acceleration of calculations by several orders. In this connection there arises the problem of acceleration of thermal properties calculations. One of the ways to solve this problem is to use Graphics Processing Unit (GPU) computing performed on modern graphics cards. The use of multiple parallel GPU-processors can speed up the calculation of the thermal properties. In this paper the comparison of computation speed with the usual CPU and with CUDA technology from NVIDIA is considered. Two different formulations for the properties of water and steam are under consideration: one of them is Formulation IF-97 for industrial use from the International Association for the Properties of Water and Steam (IAPWS) and another one is IAPWS-95 for General and Scientific Use (also from IAPWS). Formulations for transport properties are also examined.