Abstract

This paper discusses the thermal energy storage units, heat storage materials and cooking performance of solar cookers with heat storage surveyed in literature. It is revealed that rectangular and cylindrical containers are widely used in the heat storage devices of the solar cookers. The geometry of the storage units, however, depended on the mode of heat transport into the storage medium and out to the cooking vessel from which, three categories of solar cookers (2-stage, 3-stage, and 4-stage solar cookers) are identified. Furthermore, oils and organic phase change materials dominated in the sensible and latent heat storage units respectively. Additionally, the inclusion of high thermal conductive material into the storage medium was the principal technique used in enhancing effective thermal conductivity. Besides, it is shown that there is no significant difference between the cooking power of cookers equipped with sensible and latent heat storage units. However, the design parameters of the cookers as well as thermal diffusivity of the storage medium greatly influenced the cooking power. The 3-stage cookers outperformed their 2-stage counterparts whereas cookers with cooking vessels integrated to the thermal storage unit outperformed the ones with non-integrated cooking vessels. On the other hand, lower thermal diffusivity of the storage medium increased cooking power in cookers with sensible heat storage but decreased the cooking power in cookers with latent heat storage. Finally, it is shown that the quest for the development of high temperature thermal storage units, and the optimization of the geometry as well as heat transfer characteristics of thermal energy storage units remain the potential areas of research in heat storage for cooking.