Comparative study on thermal performance of cross-matrix absorber solar collector with series and parallel configurations

By

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Abstract

This paper presents an experimental study comprising two CMA solar collectors with parallel and series arrangements on a forced convection solar drying system. The parallel and series solar collectors were investigated to evaluate the arrangement type's effect on the thermal performance. The experiments were conducted using artificial solar radiation that varies from 300 to 900W/m(2) with the air velocity of 0.5-2 m/s. The arrangement's efficiency was evaluated based on the drying chamber's thermal delivery from the collectors, thermal gains, and drying efficiencies, including air velocity effect and pressure drop. Results show that the solar collectors' parallel arrangement leads to higher air temperature inside the drying chamber than the series by 3.87 degrees C. The thermal efficiency of 33.89% is achieved for the parallel setup than the series of 27.73%. The series arrangement is superior to the parallel in terms of the pressure drop across the solar drying system. Drying efficiency is observed at a higher air velocity of 2 m/s for both arrangements than lower airflow of 0.5 and 1 m/s. Parallel configuration showed promising performance in drying efficiency and low energy usage compared to the series arrangement in which the negative impact of higher pressure-drop was compensated.

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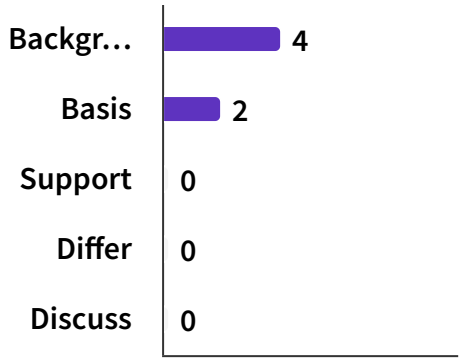

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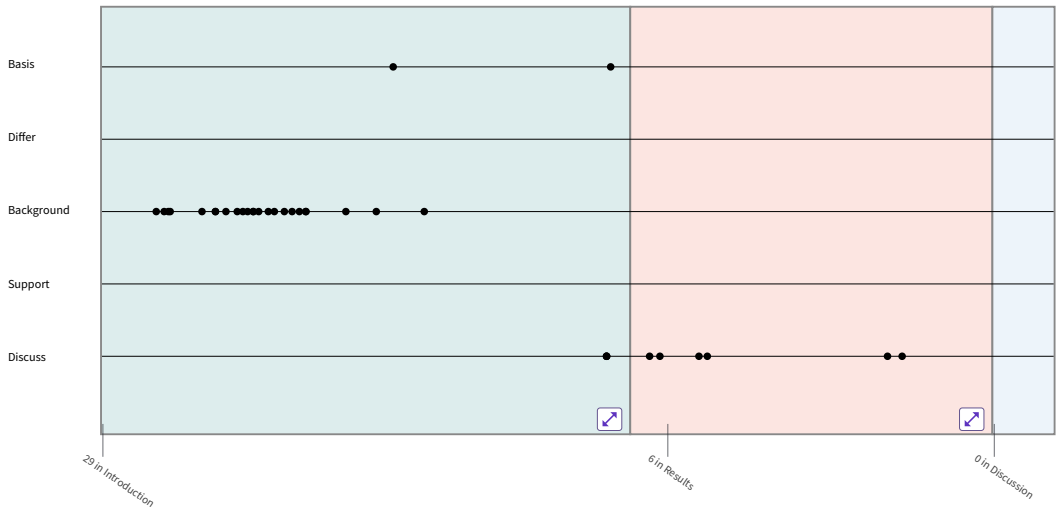

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