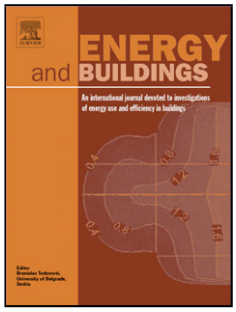

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Performance and building integration of all-ceramic solar collectors

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Abstract

In this paper, a type of all-ceramic solar collector from cheap materials is introduced. The all-ceramic solar collectors are made from ordinary ceramic and vanadium-titanium black ceramic. The ordinary ceramic raw materials mean mainly porcelain clay, quartz, feldspar, etc. The material of the solar absorber coating is vanadium-titanium black ceramic, which has a stable value of solar absorptance in the range of 0.93-0.97. Some characteristics and performance analysis of all-ceramic solar system are given. For the purpose of comparison, three solar systems consisting of all-glass evacuated tube solar collectors, metal-flat-plat solar collectors, and all-ceramic solar collectors were built. The all-ceramic solar system has the highest thermal efficiency. The heating-rate trends of three solar systems are different in the test period. The all-ceramic solar system can integrate well with building roof. The appropriate approach for the integration between the all-ceramic solar system and building roof is given. When using the integrated approach, the pitched building roof only need basic concrete structural layer, insulating layer, waterproof layer, and leveling course.

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