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# Fabrication and characterization of $\text{Li}_4\text{SiO}_4$ pebbles by melt spraying method

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### ABSTRACT

The solid breeder blanket concept proposed by the China features the tritium breeding ceramic as pebble beds in several submodules. The lithium orthosilicate ( $\text{Li}_4\text{SiO}_4$ ) is considered as first candidate ceramic breeder materials fabricated by the melt spraying method, which is favorable to other processes in terms of density and recycling. The production process involves rapid quenching of the liquid droplets from the melt to room temperature which cause internal stresses and leads in some cases to formation of microcracks and the dispersion of mechanical properties. Molar ratio (Li/Si) of the pebbles was evaluated by ICP–OES. It is shown that the Li/Si ratio of the pebbles is slightly varying from batch to batch because of evaporation of lithium at high temperatures. The crush tests on single pebbles show that a mean value of 7.0 N was obtained in crush load experiments of 40 pebbles with a diameter of 1.0 mm. It results that heat treatment of pebbles improves the density and mechanical stability. The activation characteristics for the current composition of  $\text{Li}_4\text{SiO}_4$  pebbles were assessed. The calculations were used to identify critical amounts of impurities and were compared to the results of pure material without impurities.

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