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The Effect of Crystallization Temperature on the Properties of Silicon Manganese Slag Cast Stone

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Similar to the formation process of nature granite, the molten slag is directly prepared into large volume cast stone, where the stress is affected by the mechanical and thermal expansion properties of its crystallization, which is easy to crack and lead to cracking. The phase composition and thermal expansion properties of the silicon manganese slag cast stone prepared at different crystallization temperatures were studied by DSC, XRD, SEM and CTE. The experimental results show that silicon manganese slag as the main raw material with 8% modification additives in it had been converted into large volume cast stone with qualified properties after remelting at 1500℃, casting, and curing at crystallization temperature (900℃, 1000℃ and 1050℃, respectively), and annealing at 700℃. Cast stone sample CT-900 has the best compression performance, which may be related to crystal size and structure. The crystallization interval of silicon manganese slag cast stone is 900~1100℃, and the main crystalline phase is augite and akermanite-gehlenite. CT-900 is mainly composed of augite and amorphous phase. With the increase of crystallization temperature, akermanite-gehlenite begins to precipitated in amorphous phase. At the same time, it becomes larger with augite crystal and its crystal structure becomes tighter, but its compressive strength becomes worse. Because CT-900 contains more amorphous, crystal phase transformation occurs at 1050~1100℃, and akermanite-gehlenite is formed in the residual glass phase, resulting in a large expansion coefficient. CT-1050 has a tighter crystal structure than CT-1000, resulting in a greater coefficient of thermal expansion. It shows that the lower the crystallization temperature and the absence of amorphous phase, the lower the thermal expansion coefficient of the sample. At the same time, for a sample, a smaller cooling rate is conducive to a lower thermal expansion.

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