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Abstract
Recently, Fe-Mn-Al-C alloy castings and forgings have been developed at some special applications, such as high-temperature furnace strips, golf clubs, precision industrial castings, etc. Several patents concerning Fe-Mn-Al-C alloys have been licensed, indicating that the Fe-Mn-Al alloys have great potentiality for some specific applications. However, according to the previous studies, the corrosion and wear properties as well as property of surface hardness of Fe-Mn-Al-C alloys are poor. It is apparent that in order to improve the Fe-Mn-Al alloys to be utilized in industrial applications, the improvement of the surface properties of the Fe-Mn-Al alloys should be investigated. The purposes of the present research are to investigate the effects of the manufacturing parameters on the cohesion and surface properties of WC/Co coatings onseveral Fe-Mn-Al-C alloys by plasma spraying technology.
The optimum parameters of WC/Co coating are investigated first and the WC/Co coating were performed to various Fe-Mn-Al-C alloys. Based on our experimental observations, it is concluded as belows: (1) Metco73F-ns-1 (including 17% Co) is more suitable for Fe-Mn-Al-C alloys to achieve good hardness and cohesion. (2) The optimal manufacturing parameters of WC/Co coating on Fe-Mn-Al-C alloys are selected to be “plasma current = 750A” and “spraying distance = 125mm”. (3) The surface hardness of Fe-Mn-Al-C alloys can be improved significantly by plasma spraying WC/Co coatings. The surface properties of WC/Co coatings are affected by microstructures and mechanical properties of different Fe-Mn-Al-C alloys. In the present study, WC/Co coating on the Fe-28Mn-8Al- 10Co-1C alloy can achieve a maximum hardness value of Hv300984. (4) The wear properties of the WC/Co coated Fe-Mn-Al-C alloys also improve significantly. The wear properties of the WC/Co coating depend on the wearing rates of the original Fe-Mn-Al-C alloy. It is concluded that the better wear properties of the WC/Co coating always result from the lower wearing rate of the Fe-Mn-Al-C alloys.
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