Enhanced wear protection by microstructural design of high speed steel laser hardfacings

Manel Rodríguez Ripoll
AC2T research GmbH, Wiener Neustadt, Austria

The use of components in highly demanding applications requires the design of new materials that are able to fulfil the increasing demands in terms of high strength, toughness and wear resistance while simultaneously providing an adequate corrosion protection. However, in many demanding applications such as mining, dredging, tunnelling or in agricultural equipment, the size of the used components limits the use of these novel materials due to economic constraints and their application is often restricted to the form of thick coatings, commonly named claddings or hardfacings. Hardfacings provide a cost-effective solution to increase wear and corrosion resistance of components operating under aggressive environments. However, the toughness of hardfacings is sometimes not adequate due to the high cooling rates undergone during the deposition process, which results in a high cracking susceptibility and an excess of brittleness in operation. In order to enhance toughness of laser hardfacings, two main parameters can be modified: heat treatment of the hardfacing during or after deposition or chemical composition of the alloy. A modification of the chemical composition is often preferred for economic reasons, since hardfacings are mostly used in an as-deposited condition. The present work addresses the role of niobium as doping element for microstructural design of high speed steel laser hardfacings in order to increase their toughness and ductility while simultaneously maintaining hardness thus enhancing their wear and corrosion resistance.