

Dry sliding wear performance of an annealed TiNi alloy with different nickel contents

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Abstract: The wear behaviour of the TiNi alloy tested at different conditions (2 and 4N as applied loads and 40, 50 and 60 wt% as nickel contents) was investigated. For this purpose, two main experimental techniques consisting of wear and indentation tests were used. Scanning electron microscopy (SEM) and laser source profilometry were employed to reveal the wear mechanisms and the affected worn surfaces. Furthermore, design of experiments planning introducing factorial design as well as response surface was adopted to attempt predicting the coefficient of friction according to the planned test parameters. Nanoindentation results showed that all the TiNi alloys are harder than a TA6V4 alloy which is commonly used in dental implant. Particularly, the TiNi60 alloy exhibited superior superelasticity, characterized by a lower E/H ratio and a higher depth recovery ratio than the TA6V4 alloy. Besides, the wear rates underwent a substantial increase with the increase of the applied load but a decrease with increasing the Ni content. The worn surfaces analyses revealed an enhanced resistance to adhesive and abrasive wear with increasing nickel content.

Keywords : TiNi alloy, factorial design, Wear Resistance, superplastic behaviour