

ABSTRACT

As one of the key areas of dentistry, orthodontics focuses on the correction of bite abnormalities and smile aesthetics. Advances in materials science and coating technologies have opened up new perspectives for orthodontic treatment, focusing on improving both the performance and functionality of orthodontic appliances. In the context of constantly evolving patient needs and clinical challenges, functional coatings on orthodontic arches represent an important area of research that can contribute to revolutionising traditional treatment methods.

Orthodontic arches, a key component of fixed braces, play a central role in directing and moving teeth into the desired position. However, they struggle with problems such as corrosion, friction and bacterial adhesion, which can affect treatment efficiency and patient comfort. In response to these challenges, this dissertation focuses on the research and development of innovative functional coatings for orthodontic arches

The aim of the present study was to investigate the effects of different types of coatings, such as titanium dioxide (TiO_2) and its silver doped variant ($\text{TiO}_2:\text{Ag}$), on the properties of orthodontic arches. Their ability to reduce biofilm, antimicrobial and anti-adhesion properties, which is crucial for maintaining oral hygiene during treatment, were studied. The mechanical and physicochemical properties of orthodontic arches with the coatings applied were also investigated. Multi-point bending tests, evaluation of surface roughness, and coating thickness and continuity were conducted.

These tests are important for understanding how orthodontic arches respond to loads under realistic conditions, which is fundamental to designing protective coatings capable of withstanding dynamic and variable forces acting in the oral environment. The dissertation makes an important contribution to the development of protective coatings used on orthodontic arches, which can significantly improve the functionality and reliability of orthodontic treatment, thereby increasing patient satisfaction and comfort.