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Etching rate reactions on titanium surfaces under various electromagnetic radiation frequencies

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The surface topography of medical implants is critical to their successful integration in the human body. To ensure optimum bone apposition, the surface of the implant material (e.g. titanium) should be modified to include desirable micro-, sub-micro-, and nano-topography features, multiscale features. This research outlines critical background information to understand the importance of surface topography features on osseointegration. It also details experimental findings on the etching rate of sulfuric acid (H_2SO_4) on titanium coupons. Once the reaction rate of sulfuric acid and titanium was understood at various temperatures and time periods, it was necessary to find a mechanism to control the reaction rate. The report suggests the use of electromagnetic radiation (EMR) to control the reaction rate and outlines the experimental findings of preliminary tests between titanium and sulfuric acid under the presence of EMR. This report describes attempts to develop and realize replicate of rough surfaces containing multiscale features.