

ABSTRACT

This study aims to fabricate and characterize a bolus made of silicone rubber (SR) composite and tantalum (Ta) nanoparticles to enhance the effectiveness of surface dose distribution in radiotherapy using a LINAC. Tantalum nanoparticles were synthesized using the Nd:YAG pulsed laser ablation method with synthesis durations of 20 minutes, 40 minutes, and 60 minutes and were characterized using XRD, FTIR, and TEM. The results showed that the tantalum nanoparticle peaks at 2θ were found at 23.138° , 28.733° , 37.003° , 42.776° , 44.509° , and 50.311° , corresponding to crystal planes (9 0 1), (0 0 2), (0 1 2), (16 1 1), (17 1 1), and (10 1 3). The Ta-O absorption peaks appeared at wavenumbers 683 cm^{-1} and 1067 cm^{-1} , and the tantalum nanoparticles exhibited a spherical shape with an average size of 10.84 nm. Surface dose measurements with LINAC using 6 MeV and 9 MeV electron beams indicated that the SR-Ta bolus with a synthesis duration of 40 minutes had the lowest surface dose of 1.181 Gy at 9 MeV, while the bolus with a synthesis duration of 60 minutes had a surface dose of 1.188 Gy at 9 MeV. This dose reduction suggests that SR-Ta has potential for development as a bolus material.

Keywords: *Radiotherapy, bolus, silicone rubber, tantalum, surface dose, LINAC*