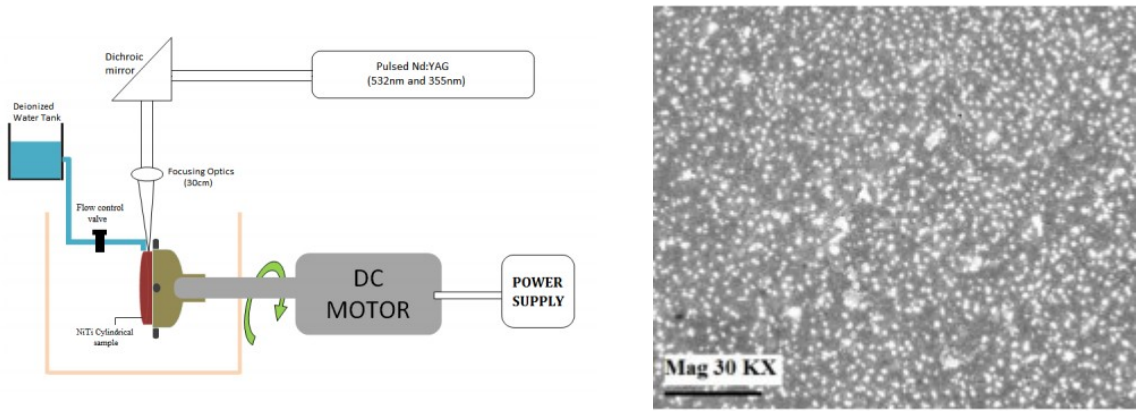
Novel in synthesizing spherical nanoparticles through Laser micro-grooving on the rotating target of NiTi using Underwater Solid State Nd: YAG Laser Ablation Technique

Nanomaterials have become increasingly popular, promising a breakthrough in the development of novel methods in bio-sensing, medical diagnostics, surface plasmonics (photo-voltaics applications), therapeutics, cosmetics coatings, etc. under water Laser assisted ablation can offer novel opportunities to solve the toxicity problem caused by contamination with chemical precursors or additives in chemical synthesis procedures. However, the mechanism of nanoparticles formation is still not well understood and challenges remain in size control and productivity. This is a technique to improve the ablation efficiency of nanoparticle than the existing techniques of laser ablation. The process also finds an alternative way to do micro-grooving on the target periphery during rotation which could be used as an additional way in application like laser surface texturing in biomedical applications etc. and can be further optimize by parameters such as pulse rate, scan speed, wavelength, groove width and pitch. This novel method has been employed to on NiTi target and investigate its capability toward generating alloyed nano particles. Influence of laser wavelengths, laser fluence and rotation speed of the target (in the method of rotating the NiTi target during laser ablation) on the size, shape, productivity and quality of the NiTi nanoparticles, generated through underwater solid state Nd:YAG laser ablation technique. The experiments were performed on Ni55%-Ti45% sheet to synthesize NiTi nano-particles at three different wavelengths (1064 nm, 532 nm and 355 nm) with varying laser fluence ranging from 30-50 J/cm2 and with varying speed of the rotating NiTi target from 10 rpm to 40 rpm (rotation per minute). Size ranging from 8 nm to 150 nm could be achieved by varying different parameters. The crystallinity and lattice spacing of NiTi alloy nanoparticles were confirmed from the XRD analysis and TEM images, respectively.



The schematic layout of the experimental setup and spherical NiTi nano particle generated