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# A novel approach of chemical mechanical polishing for a titanium alloy using an environment-friendly slurry

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## Highlights

- A novel approach of chemical mechanical polishing is proposed for a Ti alloy using an environment-friendly slurry.
- The surface roughness  $R_a$  of 0.68 nm is obtained, which is lower than those previously reported for a Ti alloy.
- Corrosion potential agrees well with the polished surface quality of Ti-6Al-4V.

**Abstract:** In this study, a novel approach of CMP is developed using an environment-friendly slurry consisting of silica, hydrogen peroxide ( $H_2O_2$ ), malic acid and deionized water. This is different from the traditional polishing, in which hazardous chemicals are used for Ti alloys. The surface roughness  $R_a$  of 0.68 nm is obtained over a measurement area of  $70 \times 53 \mu m^2$ , which is lower than those previously reported for a Ti alloy. This is polished by the developed optimal CMP slurry. Polishing mechanism is investigated using electrochemical and X-ray photoelectron (XPS) measurements.  $H_2O_2$  dominates the corrosion process during CMP using the developed environment-friendly slurry. Corrosion current of  $H_2O_2$  is consistent with the reactants of titania, alumina and vanadia formed on the surfaces of Ti-6Al-4V after CMP. Corrosion potential agrees well with the polished surface quality of Ti-6Al-4V. Chemical reaction equations are proposed

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