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Abstract
The ink jet type of the 3-Dimension Rapid Prototyping (3D-RP) utilizes ink jet technology to shoot adhesive droplets to plaster powder forming a layer of an RP model. The prototype can be obtained by accumulating these layers. In this research, PVA or PVP were added to regulate the surface tension and viscosity of the adhesive solution. When PVA content was 14 wt% and PVP content was 17 wt%, the viscosity of adhesive solution was 30 cp and 28 cp, respectively. However, the surface tension of adhesive solution was only dependence of the PVA content, and surface tension would drop from 60mN/m to 46mN/m with the PVA content decreased. Notable, the increasing H2O content in adhesive solution can not only improve the color extension of the green part, but also has better mechanical strength. The stress of green part could enhance from 167mN/mm2 to 993mN/mm2 when the water content of adhesive was over 90 wt%.
On the other hands, when cyanoacrylate was used as the post-curing agent of green part, the internal stress would be formed within the green part and destroy its shape due to fast curing reaction of cyanoacrylate. In this study, butyl acrylate was added to cyanoacrylate post-curing agent to descend the curing reaction in green part. The post-curing reaction rate of mixture was successfully delayed, however, the mechanical strength of green part was not decreased. In addition, when used the immersion method for green part can obtain better mechanical strength than that of painting method.
Sol-gel process is one of the method to prepare the post-curing agent. The mixed oxides materials, such as Si(Ti)O2 was prepared on this study. FTIR spectra and X-ray diffraction patterns were using to identify the product of the Si(Ti)O2, and the particle size was about 500~800 nm measured by SEM. After, a suitable mole concentration in the Si(Ti)O2 gel of titanium is under 35 mol% to keep homogeneous phase. Inorganic post-curing agent increased the mechanical strength of the green part. After treated with 900oC, the strength of green part can enhance from 0.2 Mpa to 1.2 Mpa when the titanium content was under 35 mol%.
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