

Prediction of Porosity Defects in Platinum 950 Centrifugal Investment Casting

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Abstract

Nowadays, the vacuum investment casting process is typically employed for producing jewelry parts with high dimensional precision and excellent surface finish. However, casting defects such as porosity are still often be found. Porosity defects, such as shrinkage porosity and gas porosity, on the casting surface are usually major concerns. Excessively high pouring (superheat) temperature and improper sprue design can lead to porosity defects. These defects can cause loss in production time and waste of raw materials during the manufacturing process. The purpose of this work is to study the effects of pouring temperature and sprue design on porosity defects in jewelry casting process using "FLOW-3D CAST" software. The prediction of shrinkage porosity was based on the Niyama criterion. The CAD model and the process information of the centrifugal investment casting of Pt950 (95% Platinum alloy) from the example factory, Christy Gem Co., Ltd., were used in this study. Additionally, necessary database of Pt950 in terms of material properties and thermo-physical properties collected from the literature review is presented in this paper. The simulation results showed how much superheat and sprue designs have effects on the porosity defects. The results obtained from this research would contribute to the improvement of jewelry casting process in the future.

Keywords: Investment casting, Jewelry, Platinum 950, Shrinkage porosity, Computer simulation