開発と研究

プロセス機能展開表を活用した光学ガラスの溶解技術開発

Development of Optical Glass Melting Technology Using a Process Task Visualization Chart

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In the development of new and improved types of optical glass, we have applied quality engineering to small-scale evaluation in the laboratory, with the goal of vertical ramp-up in the melting process. Previously, we had optimized each process individually in small-scale experiments, determined the optimal production conditions, and then carried out a large-scale experiment to confirm that these conditions were actually suitable for volume production. A problem that had sometimes delayed the start of volume production in the past was that the small-scale experimental results could not be replicated in the large-scale experiment. To solve this problem, we started by surveying the entire process, selecting the factors to be studied, and studying the optimization of the process as a whole. Next we adjusted the evaluation metrics and noise factors to obtain small-scale evaluation methods that would give results that could be replicated in large-scale experiments. By applying this methodology to many types of glass, we obtained a body of production technology information that turned out to be applicable to many types of optical glass in the same family. The result was that we were able to ramp up volume production of even newly developed types of glass quickly, without performing orthogonal array experiments.

Key words : optical glass, internal transmittance, S/N ratio, Taguchi methods, quality engineering

1. はじめに

1.1　光学ガラスについて

光学ガラスは，カメラや望遠鏡，顕微鏡など光学機器において像の伝達に用いられるガラスであり，レンズやプリズムとして使用される。光学ガラスの光学的性質を表す光学定数は，**図1**に示すように，d線（波長587.6 nm）に対する屈折率n_dと，色分散を表すアッベ数ν_dの二つの組合せで分類される。F線（波長486.1 nm），C線（波長656.3 nm）に対する屈折率をそれぞれn_F，n_Cで表すと，アッベ数は次式で定義される。

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