FORUM ON INTERNATIONAL STANDARDS FOR CRYOGENIC POLYMERS AND COMPOSITES

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INTRODUCTION

In the young science of cryogenics, an in-depth background knowledge has yet to be established in some areas. This is particularly true of the use of plastic materials in a cryogenic environment. For many applications, where plastic materials have been successfully employed, reports on these materials have attempted to establish this background. In many cases, however, such reports have either inadequately defined the material or used a manufacturer's trade reference that is not clearly understood—particularly on an international basis—and, as a result, effective communication is inhibited, the value of the report is reduced, and progress is hindered.

The formulating possibilities with nonmetallic materials are as diverse as they are with their metallic counterparts, but the latter, being an infinitely older science, has had the opportunity of classifying metals and alloys and reducing the available materials to a manageable number of the most useful types. This is an opportune time to consider a similar exercise for nonmetallic systems.

OBJECTIVES

First, a classification system relating only to epoxide resins should be considered. Such resins are available internationally, covered by a range of manufacturers' codes, and represent the class of plastic materials in the widest general use. Because of the range of materials available, coupled with the diverse range of applications and the profusion of manufacturers' trade names, a unified, internationally recognized system of designating resin systems has become necessary. The objectives are:

1. Classify a selected number of epoxide resin systems with an international number and tabulate them with respect to different manufacturers' trade references from different countries.

2. Establish an overall system to categorize unfilled resin systems on the basis of the processing characteristics of liquids and the physical properties of cured solids, in conjunction with the international designation proposed in objective 1.

3. Establish a similar system for filled resins and for fiber-reinforced composites, but with more general classifications. List and publish details of the physical properties of each resin system proposed.

A scheme such as this would allow easy communication between engineers on a national and international level and permit more effective use of materials that are of proven value in low-temperature environments. The bewildering choice between candidate resin systems would be reduced, so that selection would become a problem of manageable proportions.

MANUFACTURERS' VIEWPOINT

Three major points were eloquently made by the representative of the resin manufacturers:

1. Although the products offered by various companies are often broadly similar, they are not necessarily directly equivalent. Therefore, in some cases, variable properties are expected in products using nominally the same materials but supplied by different manufacturers. This is not an insurmountable problem, since these differences, although real, are constant and therefore readily quantifiable. Unfortunately, it will increase the amount of basic standardization work necessary, but this is a small price to pay for a single all-embracing international system.

2. Improvements that increase the efficiency or profits of manufacturers would be welcomed, but additional complications that make trading more difficult would be opposed. Each manufacturer offers a fairly comprehensive range of epoxide resins and associated materials, which means that sales departments already have a difficult and detailed job. Also, there are a number of military specifications to which resins conform; if each specialist group of users were to define its own standards, the situation would decline rapidly. Therefore, it will probably take some time for resin suppliers to accept any new standardization attempt, and any such system is likely to be successful only if it can be applied universally. In short, a standardization procedure could aid the resin suppliers, but only if it were widely accepted and its introduction into any sales department came only after the system was a proven success.

3. Since both suppliers and users are pursuing a policy of constantly reviewing and updating their materials, there is a distinct possibility that any standards adopted would require constant review. If this were the case, then, again, the system could be a hindrance to both suppliers and users. In effect, is it not still too early to be attempting to define a range of materials for cryogenic applications?

USERS' VIEWPOINT

Summarizing the views of the users who attended the forum is not an easy task, but it was very clear that there would be support from the cryogenic community for any attempt to ease the problems of materials selection. The majority of users appear to be engineers and designers without special knowledge of nonmetallic materials. Since the opportunities for experimentation are limited by knowledge and cost, any system that presents reliable information in a usable form should be encouraged. The users generally agreed on six major points:

1. There is a need for some form of standard or method of designating resin systems. A wealth of experience has already been accumulated, and this information should be more readily available. Providing a comprehensive, cross-referenced list of