

Chemical Stress Resistance of Polymers

1. Scope

- 1.1** This SAE Recommended Practice provides a screening procedure for evaluating the susceptibility of plastics to environmental stress cracking by testing their resistance to pure solvents or their mixtures. This method can be used to evaluate effect of complex chemical mixtures with unknown or suspect components, which may be encountered in the polymer's environment.
- 1.2** The list of chemicals in Appendix A is intended only to serve as a guide and does not exclude any chemical that may represent the environment the polymer is subjected to in a specific application. As specific environment and exposure conditions are application dependent and could vary significantly from one application to another, the user of the document is recommended to choose the appropriate solvents relevant to the actual application environment and is not under any obligation to test the effect of all the chemicals listed in Appendix A.
- 1.3 Rationale**—SAE J2016 is based on ISO 11403-3, Acquisition and presentation of comparable multipoint data—Part 3: Environmental influences on properties. SAE J2016 is due for its periodic review but the Plastics Committee is not aware that this procedure is being utilized. Since it is equivalent in scope and procedure to ISO 11403-3, it is, essentially, a redundant document. Consequentially, the committee recommends that SAE J2016 be withdrawn as an active standard.

2. References

- 2.1 Applicable Publications**—The following publications form a part of the specification to the extent specified herein.

- 2.1.1 ISO PUBLICATIONS**—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO/DIS 175:1998—Plastics—Determination of the effects of liquid chemicals, including water

ISO 291:1997—Plastics—Standard atmospheres for conditioning and testing

ISO 294-1:1996—Plastics—Injection moulding of test specimens of thermoplastic materials—Part 1: General principles and multipurpose test specimens (ISO type A mould) and bars (ISO type B mould)

ISO 294-2:1996—Plastics—Injection moulding of test specimens of thermoplastic materials—Part 2: Small tensile bars

ISO 2818:1994—Plastics—Preparation of test specimens by machining

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

SAE reviews each technical report at least every five years at which time it may be reaffirmed, revised, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2008 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER:

Tel: 877-606-7323 (inside USA and Canada)
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

ISO 3167:1993—Plastics—Multipurpose test specimens
 ISO 6252:1992—Plastics—Determination of environmental stress cracking—Constant tensile stress method
 ISO 10724:1994—Plastics—Thermosetting moulding materials—Injection moulding of multipurpose test specimens
 ISO 11404-3:1998—Plastics—Acquisition and presentation of comparable multipoint data—Part 3: Environmental influences on properties

2.2 Related Publications—The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 ISO PUBLICATIONS—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ISO 527-1:1993—Plastics—Determination of tensile properties—Part 1: General principles
 ISO 527-2:1993—Plastics—Determination of tensile properties—Part 2: Testing conditions for moulding and extrusion materials

3. Definitions

3.1 Environmental Stress Cracking—Susceptibility of the plastic to cracking or crazing under applied tensile stress or strain in presence of an environment that accelerates development of such cracks.

3.2 Indicative Property—A property that has been selected to reveal the influence of the environment on a material through a comparison of measurements of the property before and after exposure.

3.3 Tensile Work to Break—The area under the tensile stress-strain plot, where applied stress is determined from the ratio of the tensile force to the minimum initial cross-sectional area of the specimen. It is expressed in kJ/m^2 .

4. Symbols

σ_y	tensile strength at yield
σ_B	tensile strength at break
w_{tB}	tensile work to break
σ_{uo}	Reference value of tensile strength, prior to the exposure to the chemical
σ_{sc}^{100}	stress corresponding to a 25% reduction in the tensile strength after 100 h loading time with exposure to the chemical
σ_{wc}^{100}	stress corresponding to a 50% reduction in the work to break after 100 h loading time with exposure to the chemical
σ_{sc}^{1000}	stress corresponding to a 25% reduction in the tensile strength after 1000 h loading time with exposure to the chemical
σ_{wc}^{1000}	stress corresponding to a 50% reduction in the work to break after 1000 h loading time with exposure to the chemical

5. Test Specimens—For the determination of indicative properties, the ISO 3167 or ISO 10724 multipurpose test specimen with a machined waist region in the central part of the specimen, identical to that in the small tensile specimen in ISO 294-2, as shown in Figure 1, shall be used. The waist region serves to expose interior regions of the specimen to the chemical as well. A minimum of five specimens shall be used.

In instances where the material is expected to exhibit anisotropy, the specimen should be obtained parallel and perpendicular to the flow direction from a plate.