



Standard Test Methods for Determination of Fracture Toughness of Advanced Ceramics at Ambient Temperature¹

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1. Scope

1.1 These test methods cover the fracture toughness, K_{Ic} , determination of advanced ceramics at ambient temperature. The methods determine K_{Ipb} (precracked beam test specimen), K_{Isc} (surface crack in flexure), and K_{Ivb} (chevron-notched beam test specimen). The fracture toughness values are determined using beam test specimens with a sharp crack. The crack is either a straight-through crack formed via bridge flexure (pb), or a semi-elliptical surface crack formed via Knoop indentation (sc), or it is formed and propagated in a chevron notch (vb), as shown in Fig. 1.

NOTE 1—The terms bend(ing) and flexure are synonymous in these test methods.

1.2 These test methods are applicable to materials with either flat or with rising R-curves. Differences in test procedure and analysis may cause the values from each test method to be different. For many materials, such as the silicon nitride Standard Reference Material 2100, the three methods give identical results at room temperature in ambient air.

1.3 The fracture toughness values for a material can be functions of environment, test rate and temperature. These test methods give fracture toughness values for specific conditions of environment, test rate and temperature.

1.4 These test methods are intended primarily for use with advanced ceramics that are macroscopically homogeneous and microstructurally dense. Certain whisker- or particle-reinforced ceramics may also meet the macroscopic behavior assumptions. Single crystals may also be tested.

1.5 This standard begins with a main body that provides information on fracture toughness testing in general. It is followed by annexes and appendices with specific information for the particular test methods.

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1.6 Values expressed in these test methods are in accordance with the International System of Units (SI) and Practice IEEE/ASTM SI 10.

1.7 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

¹ This test method is under the jurisdiction of ASTM Committee C28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.01 on Mechanical Properties and Performance.

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