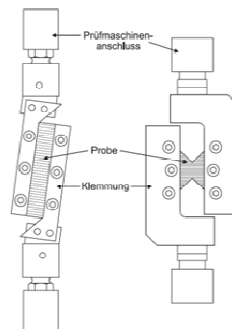


Design and construction of a tool performing simple shear

Konstruktion und Aufbau einer Probenhalterung für Schertests



ASTM D 4255 Typ A (links) und ASTM D 7078 (rechts) [Basan, 2011]

Composite materials are largely used in the automotive industry because of their good formability and their high strength to weight ratio. In order to determine the mechanical behavior of a layered composite material, it is necessary to investigate the experimental behavior of each partner material, i.e. the outer layer and the inner core material. In particular, for a complete characterization of the inner core polymer material, together with uniaxial tensile and compression tests, shear tests are necessary. Different testing methods (i.e. torsion test, three-point bending test) can be adopted to provide the shear characteristics of a polymer that lead to a complex state of deformation. A method of testing which develops a simple homogeneous shear state of deformation can be suitable for determining the characteristics of the material.

Task

Mr. Johann Kuno Friedrich Sleuwen should design and construct a testing tool to perform simple shear test on polymer foils made out of Polypropylene (PP) – Polyethylene (PE). The following scientific literature and international standards are firstly taken into account (G'Sell, 1983; Basan, 2011; ASTM D 4255; ASTM D7078). The testing tool will consist of two main parts that will be connected to the tensile/compression testing machine available in the laboratory of the Institute of Applied Mechanics. An important part of the work consists of the design of the clamping system between the machine and the tool and the definition of the PP-PE sample geometry. The tool will be able to generate a stress-strain state of simple shear within the polymer specimen.

Literatur

G'SELL, Christian ; BONI, Serge ; SHRIVASTAVA, Suresh: Application of the plane simple shear test for determination of the plastic behaviour of solid polymers at large strains. *Journal of Materials Science* 18 (1983), Nr. 3, S. 903–918.

BASAN, Ricardo: Untersuchung der intralaminaren Schubeigenschaften von Faserverbundwerkstoffen mit Epoxidharzmatrix unter Berücksichtigung nichtlinearer Effekte. Berlin, Technischen Universität Berlin, Dissertation, 2011.

Norm ASTM D4255 / D4255M - 01(2007) Standard Test Method for In-Plane Shear Properties of Polymer Matrix Composite Materials by the Rail Shear Method.

Norm ASTM D7078 / D7078M –(2012)Standard Test Method for Shear Properties of Composite Materials by V-Notched Rail Shear Method

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