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µTS Under-microscope Test System

Psylotech mechanical test instruments enable multi-scale experiments to validate meso-scale simulation. Digital Image Correlation (DIC) is an image processing technique which gives sub-pixel resolution of images taken under SEM, AFM, optical or confocal microscope. Combining microscopy, DIC and Psylotech instruments enables full field non-contact measurement of surface strains down to nanometer length scales (Fig.1)

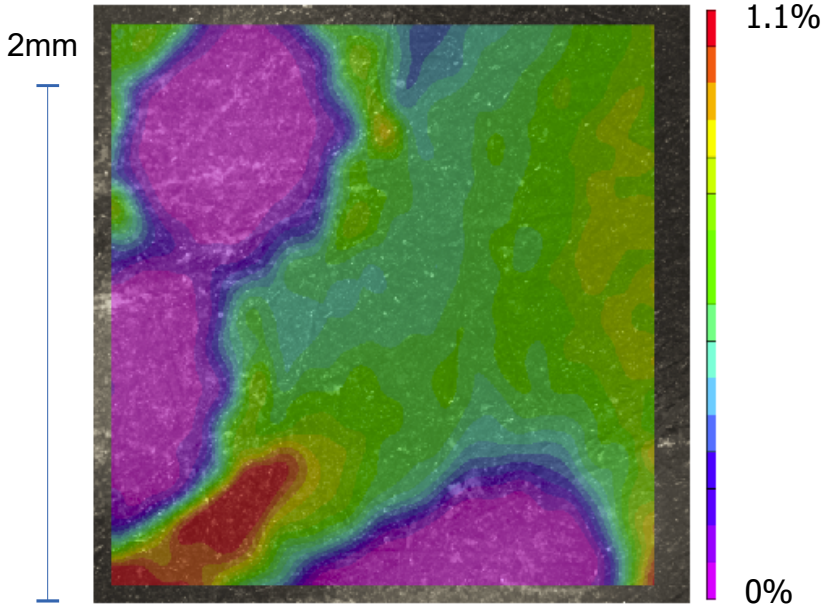

Fig.1: Local strain field on a 3D printed composite specimen surface, generated from DIC displacement field. Note smooth transition at particle/matrix interface. FEA micro-mechanics model predicted abrupt strain transition.

Consider optical microscopes; the wavelength of visible light limits optical microscope resolution to 250nm. DIC is a powerful post-processing technique for resolving feature displacements to 0.1 pixels. Combining DIC and optical microscopes gives **25 nm** resolution of the full 2D displacement field. In this way, nano length scale research can be conducted without the need for an AFM or SEM. Moreover, optical microscopy offers the advantage of fast, non-rastered imaging.

The primary challenge with materials testing under optical microscopes is out-of-plane specimen deflection. The high magnifications needed to achieve 25 nm displacement field resolution also mean a small depth of field. A few microns out-of-plane motion causes the image to go out of focus. Psylotech's µTS is a high performance universal load frame specifically designed to keep a sample in-plane during testing (see reverse page).

About Psylotech

Psylotech provides **1/**instrumentation for simulation, **2/**contract testing services, and **3/**a nonlinear viscoelastic simulation software add-on module. Under-microscope load frames offer unprecedented speed, stroke and resolution for micro & nano scale universal testing. For structural plastics, rubbers and composites, Psylotech offers a complete simulation solution, consisting of contract test data and software to unlock the value of that data.

Psylotech's nonlinear viscoelastic simulation process starts with a contract test generating data on a proprietary instrument. The resulting full 3D, viscoelastic property matrix is then fed into a reduced time nonlinear viscoelastic simulation add-on module compatible with the major FEA codes. The process addresses challenges with polymer simulation, including time, history, temperature, rate, pressure and large deformation effects.

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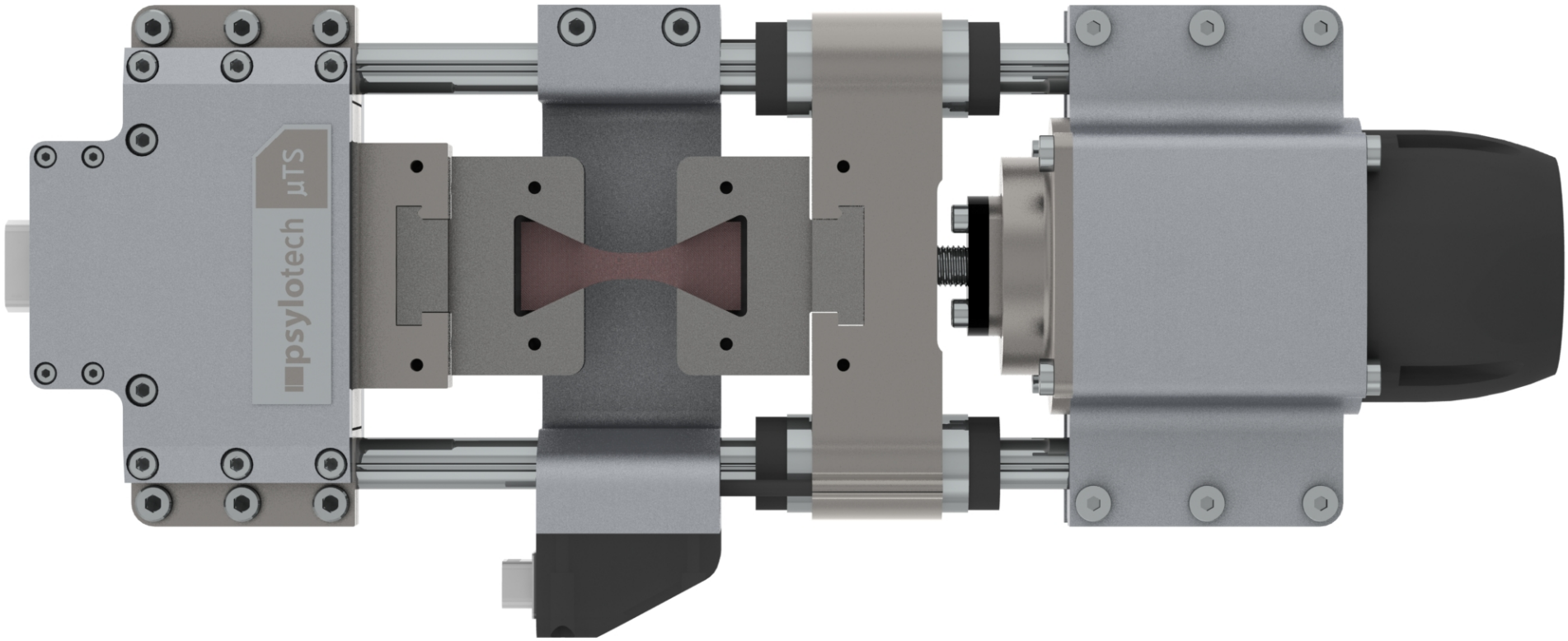

µTS: 1.6kN universal load frame for **micro** & **nano** scale testing.

- High speed, large stroke, closed loop control
- Direct-drive ballscrew actuator
- Minimal out of plane motion for SEM & optical microscope compatibility