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# How to perform nanoindentation in difficult conditions? Applications to ultra soft materials and temperature environment

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# **How to perform nanoindentation in difficult conditions ? applications to ultra soft materials and temperature environment**

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## **RESUME**

Measuring ultra soft materials or materials in extreme temperature conditions lead to the same challenges. Both present difficulties related to visco elastic properties. It's well known that in a dynamic regime, mechanical properties of such materials depend of the strain rate, excitation frequency and temperature. By using a transducer which is not adapted to specific criteria such as a low contact stiffness or ultimate stable thermal conditions, it's very easy to neglect fundamental testing conditions which can generate significant inaccurate mechanical properties. This transducer does not rely only on the quality of his components and his design. The integration of the physical phenomena, which occurs during an experiment, is also necessary, such as the adhesion influence between the tip and the material or the thermal exchanges between the materials used in the transducer, which induce errors in the temperature measurements .

The influence of the elastic contact stiffness in all directions is also critical. As this behavior is anisotropic, this lead to the right determination of the mechanical properties within the limits induced by the theory of contact mechanics. An example is given on polyimide thin layers with normal and lateral stiffnesses as well as adhesion effects on gels