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Special Seminar

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## Hierarchical Multi-Level Modelling of Plastic Anisotropy of Textured Polycrystalline Materials

Polycrystalline metals with a pronounced crystallographic texture feature anisotropic plastic behaviour. This should be taken into account in finite element (FE) simulations of metal forming processes, or in predictions of sheet formability. One of the ways to achieve this is the use of an anisotropic constitutive model described by an analytical expression (such as an anisotropic yield locus) which contains a certain number of parameters to be chosen in such way that the desired anisotropy is reproduced. It is possible to identify these parameters using mechanical test results. An alternative approach, called "hierarchical multilevel method", is to identify the parameters using a multilevel model. Such model would typically take the crystallographic slip in the individual grains of the material into account, and it needs a description of the microstructure. This can be the Taylor or the more sophisticated ALAMEL model [1]. such models need information about the microstructure such as the ODF of the texture. In any case, such models could be used to predict the anisotropic response of the material for a large number of stress or strain modes, thus enabling the identification of the parameters of a sophisticated analytical constitutive model. A method like this, called the "Facet" method [2] will be discussed. Results obtained for the prediction of earing in deep drawing will be shown.

1 P. Van Houtte, S. Li, M. Seefeldt and L. Delannay: "Deformation texture prediction: from the Taylor model to the advanced Lamel model", Int. J. Plasticity 21 (2005) 589-624.
2 P. Van Houtte, S. K. Yerra, and A. Van Bael: "The Facet method: a hierarchical multilevel modelling scheme for anisotropic convex plastic potentials." Int. J. Plasticity 25 (2009) 332-360.