

Modelling of the Thixoforming Process

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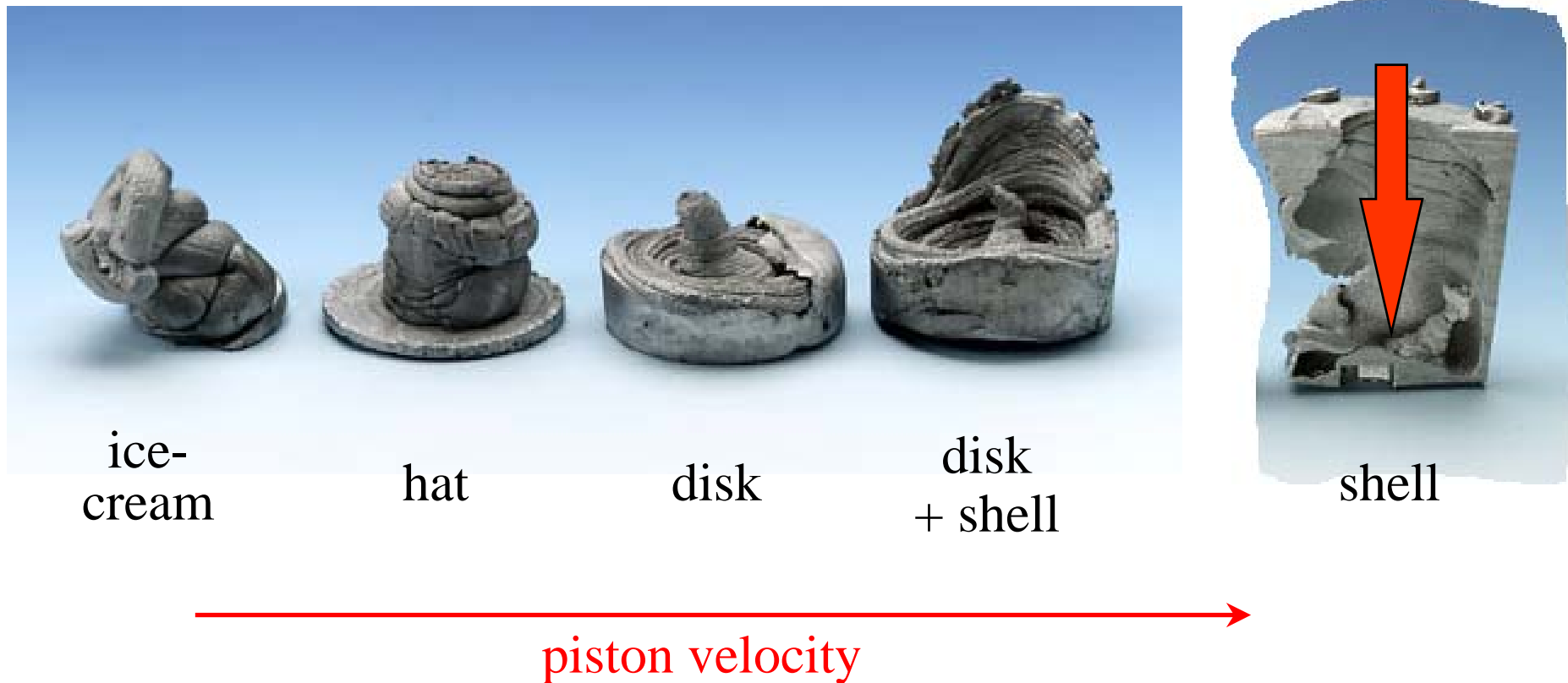
EPFL

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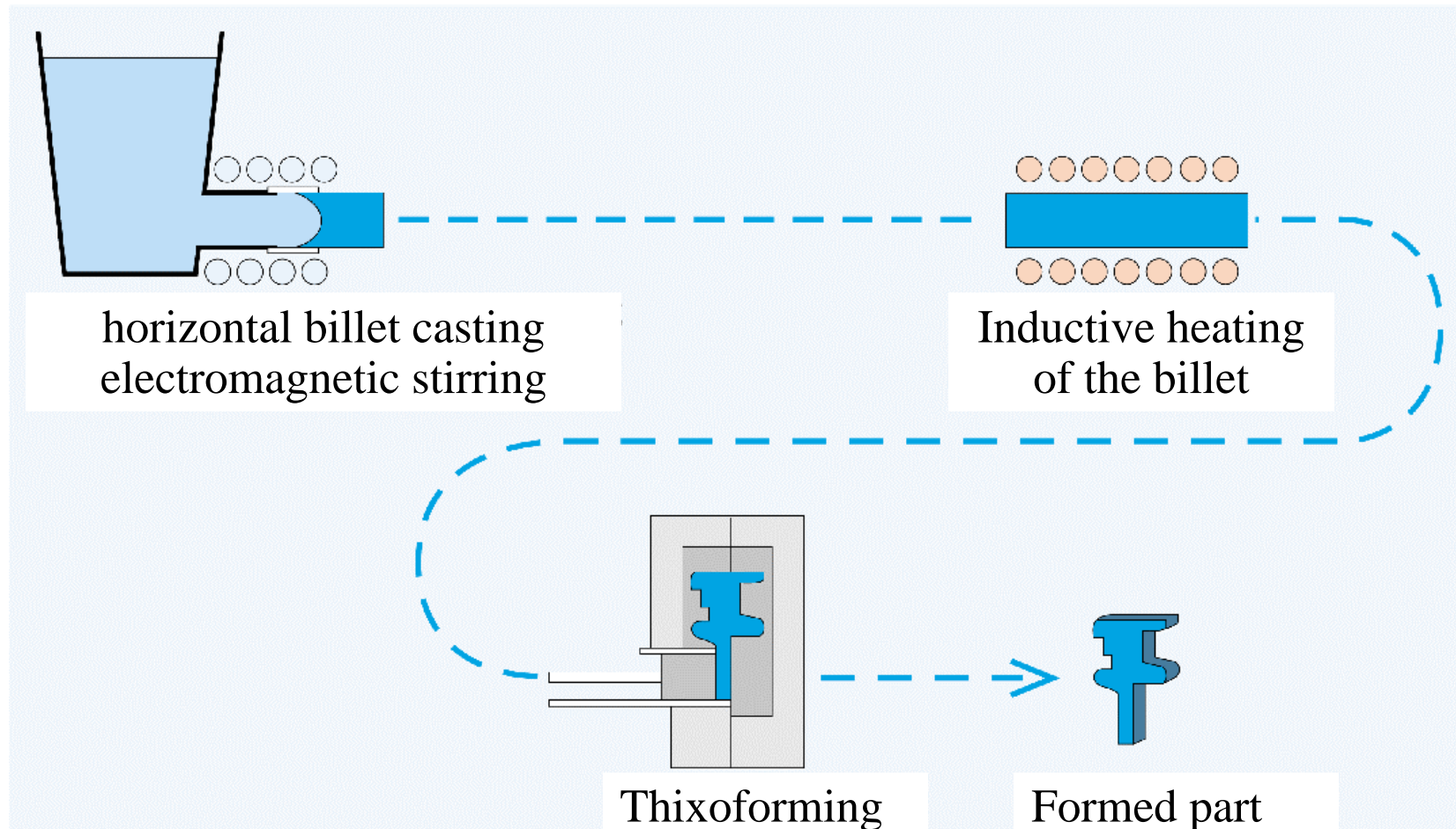
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Introduction

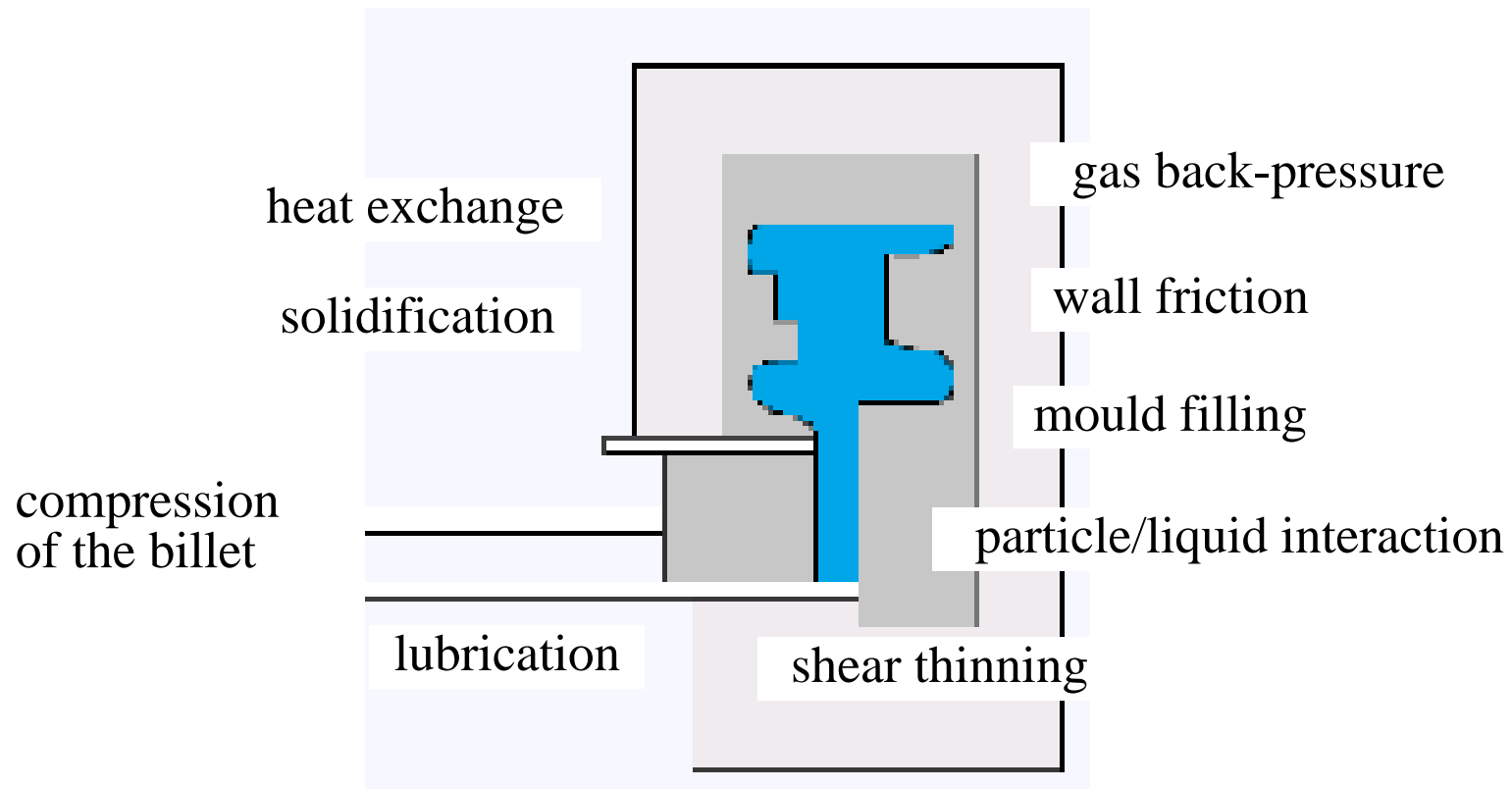
■ Flow behaviour of thixotropic A356 alloy



The Thixoforming Process used at Alusuisse

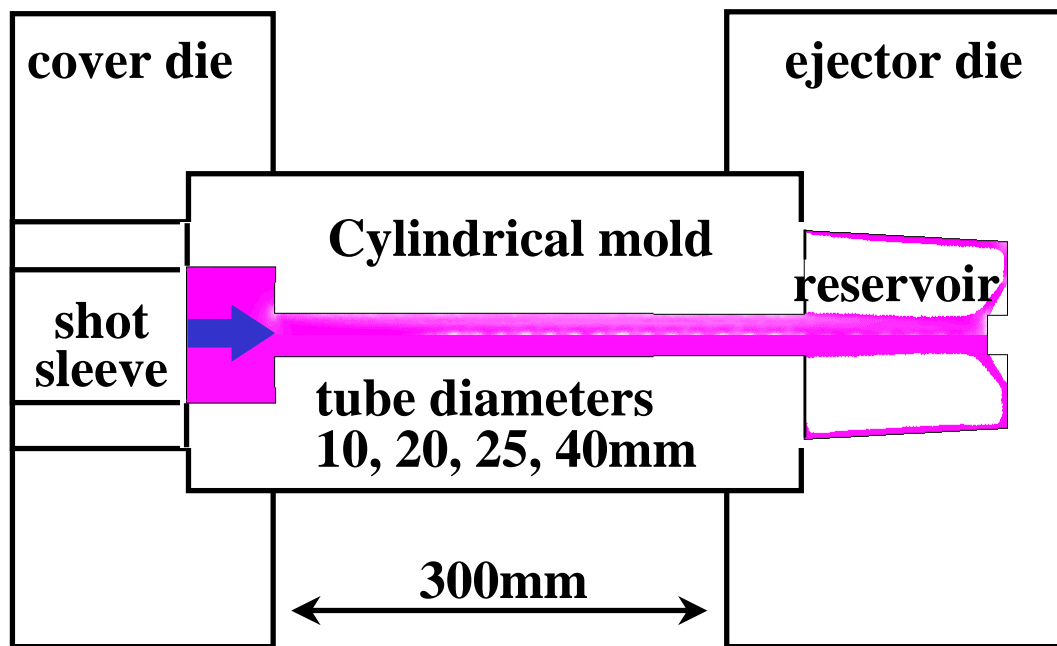


Physical Phenomena



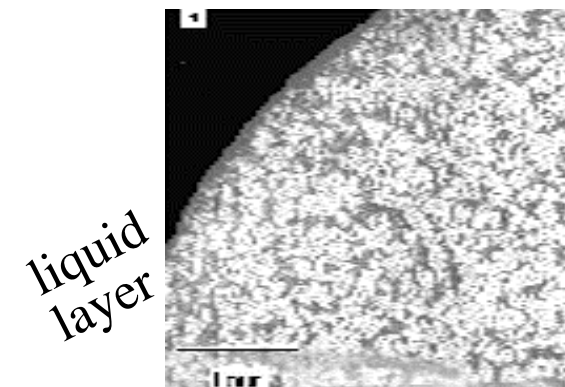
Determination of Boundary Conditions

Experimental setup (1)



Metallography

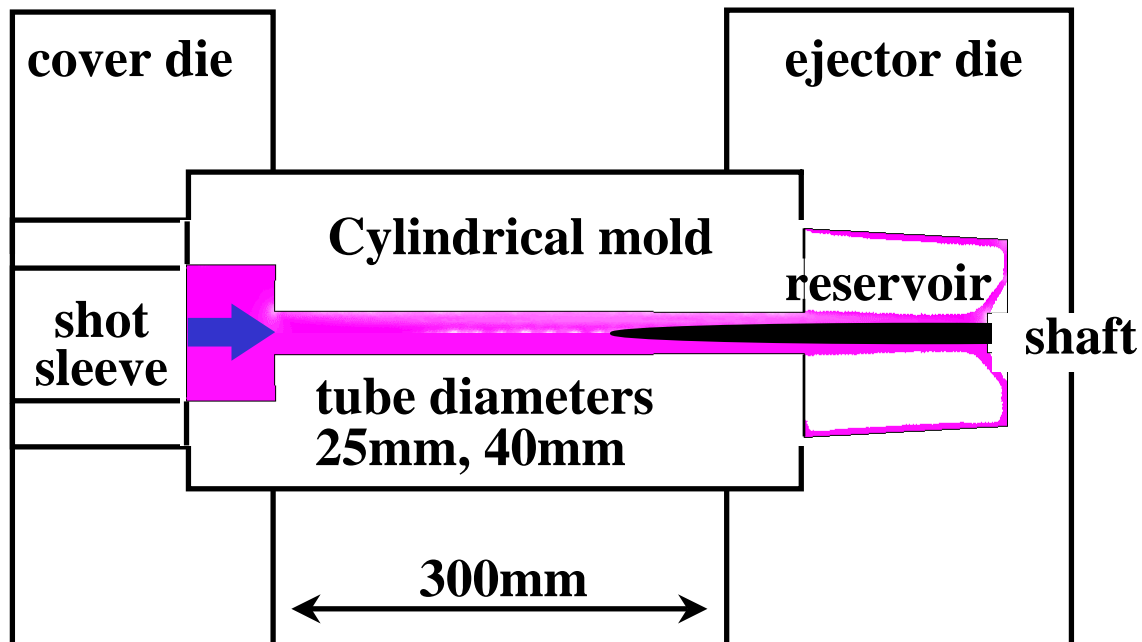
tube cross section



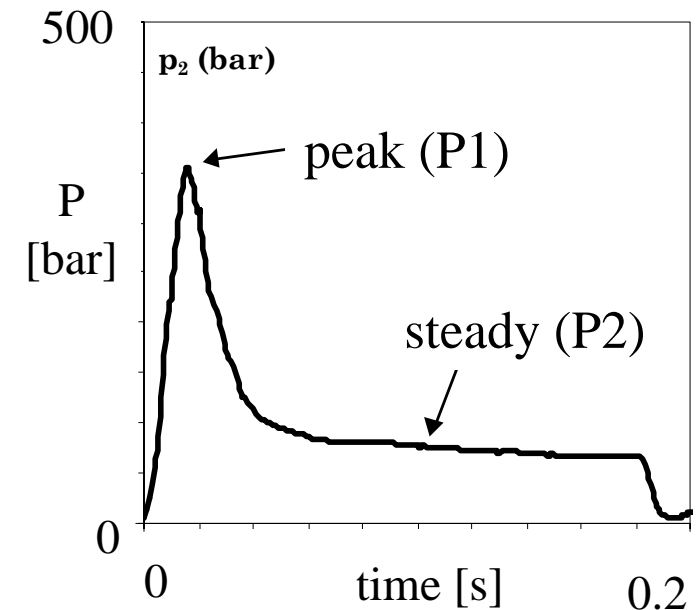
$P_{mes} < 1\text{bar}$

Determination of Rheological Data

Experimental setup (2)

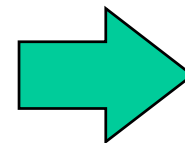
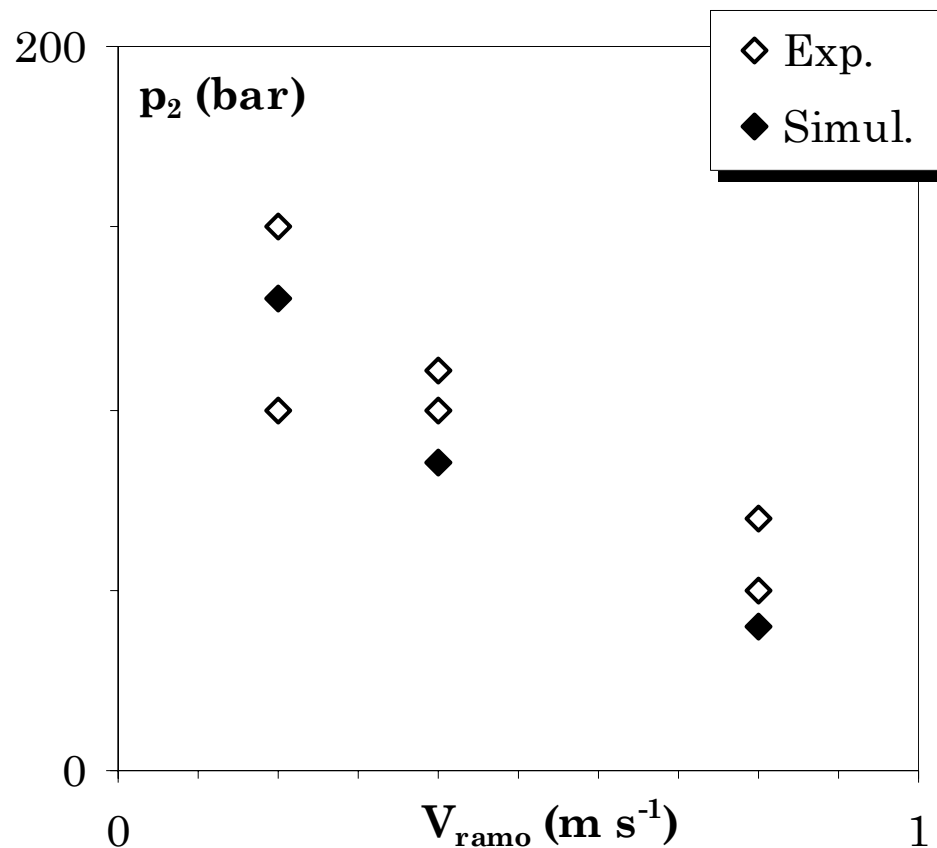


Measurements



$P_{mes} \gg 1bar$

Determination of model coefficients

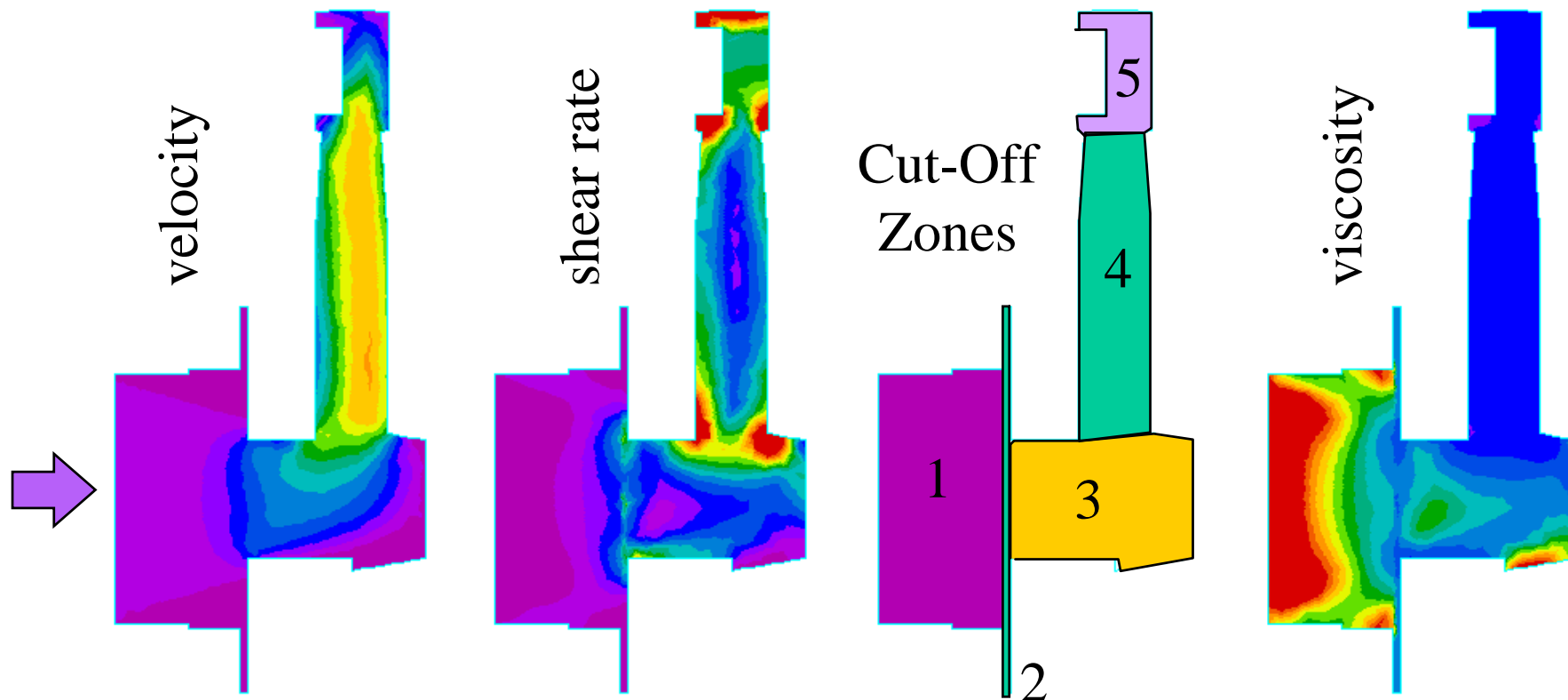


$$\mu(\dot{\gamma}, T) = \mu_o(T) \dot{\gamma}^{n(T)}$$

power law model (PL)

Treatment of the shear rate history

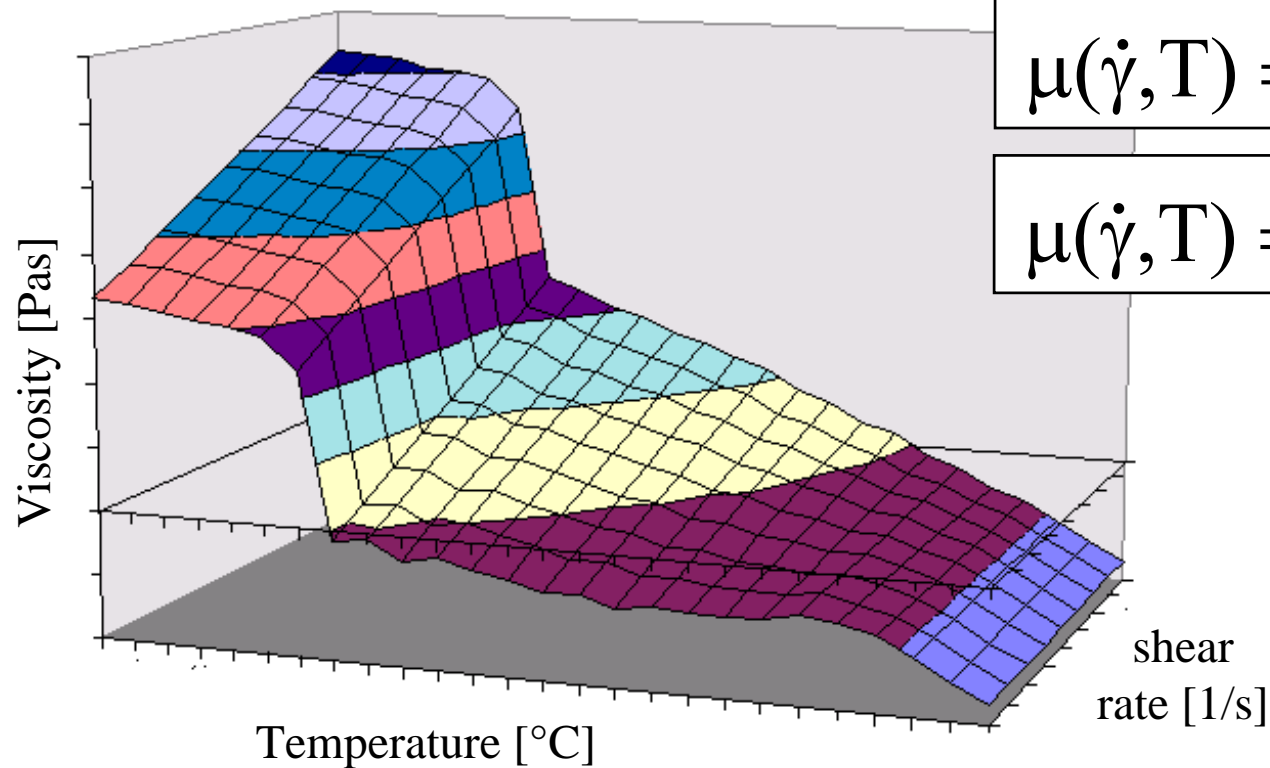
■ Definition of cut-off zones (CL)



Rheological Data and Model

viscosity data A356

PLCO model



$$\mu(\dot{\gamma}, T) = \mu_o(T) \dot{\gamma}_o^{n(T)} \quad \dot{\gamma} < \dot{\gamma}_o$$

$$\mu(\dot{\gamma}, T) = \mu_o(T) \dot{\gamma}^{n(T)} \quad \dot{\gamma} > \dot{\gamma}_o$$

Validation with Reservoir Fill Stops

