


Polymer Surfaces


Gunther Schöppe
 Yasushi Sasojima
 Thorsten Hopke
 Gerald Pätzold
 Dieter W. Heermann



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Dieter W. Heermann


Topics

- Properties of polymer surfaces and films
- Modelling of Indentation
- Mechanical reactions to indentation
- Mechanical reactions to scratching




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Introduction




We are interested in properties like:

- friction and wear
- surface toughness



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Modelling of Polymer Systems




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Modelling of Polymer Systems

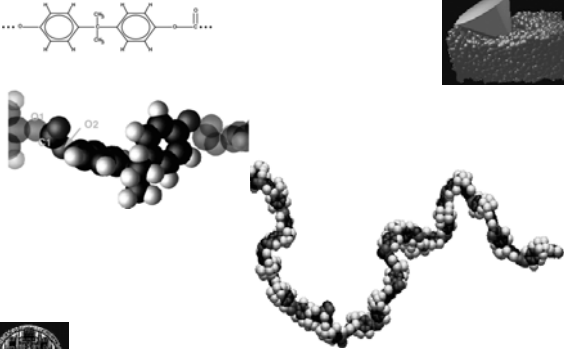

United-Atom-Modell



chain length	$N = 120$
density	$\rho = 0.91 \text{ g/cm}^3$
radius of gyration	$R_g = 15.1 \text{ \AA}$
end-to-end distance	$R_e = 37.5 \text{ \AA}$
temperature	$T = 10.12 \text{ eV}$



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Modelling of Polymer Systems

Modelling of Indentation



Dr. Olaf Wolter GmbH,
Aidlingen-Dachtel




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Modelling of Indentation

Our measurements of hardness extend the engineering hardness testing like the Brinell or the Vickers method.

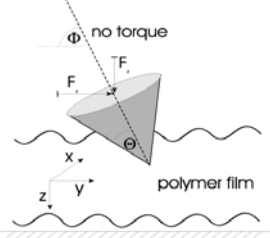
Our timescale of indentation is a tenth of a nano second whereas the above mentioned lasts minutes.

The longtime flow of the polymer is far beyond of existing computing power, on the other hand for topics like friction and wearing this is the relevant timescale.




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Modelling of Indentation



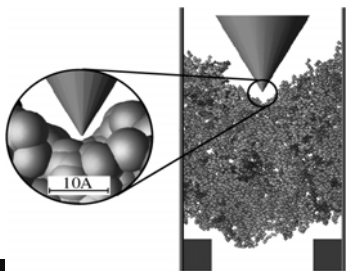

$T = 361\text{K}$
 $r = 0.91\text{ g/cm}^3$
 $N = 120$
 Film $12.2\text{nm} \times 6.1\text{nm} \times 7.1\text{nm}$

$F_{\text{extern}} = 0.4\text{ nN}$



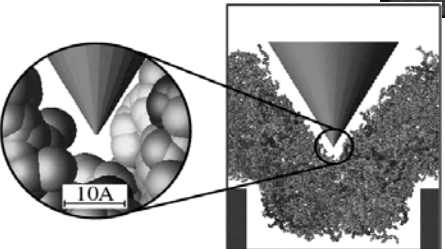

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Modelling of Indentation: Bending

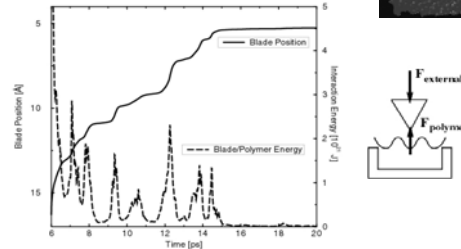

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Modelling of Indentation

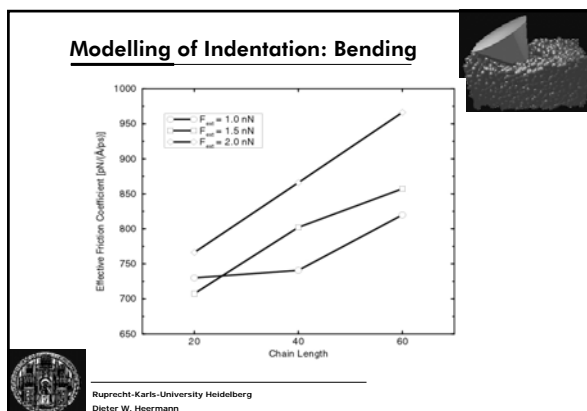
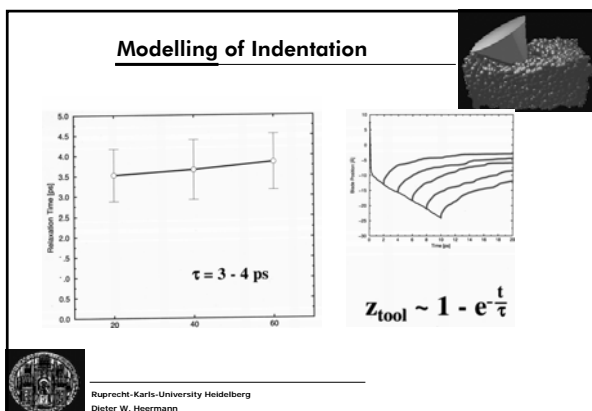
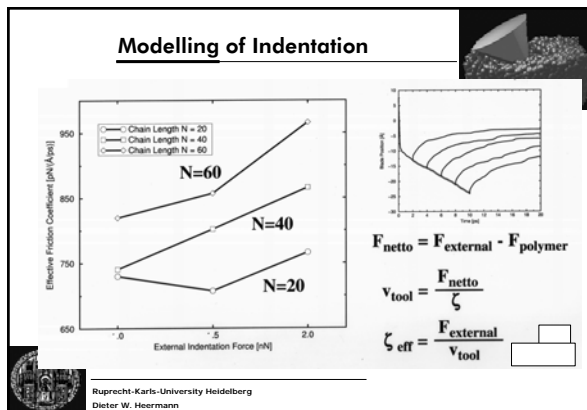
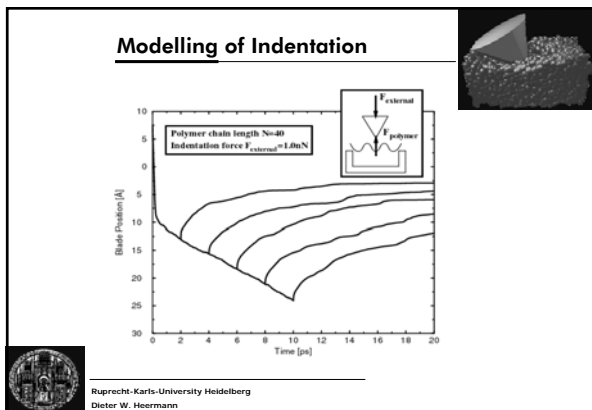
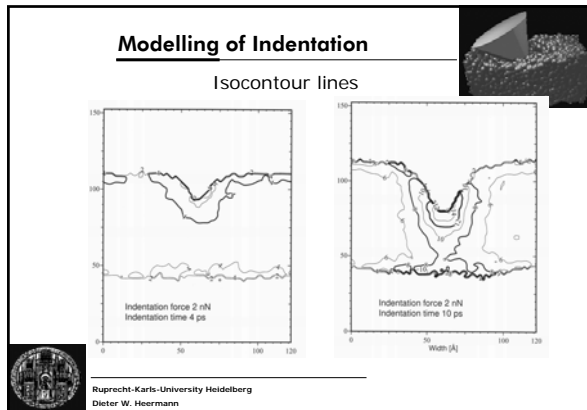
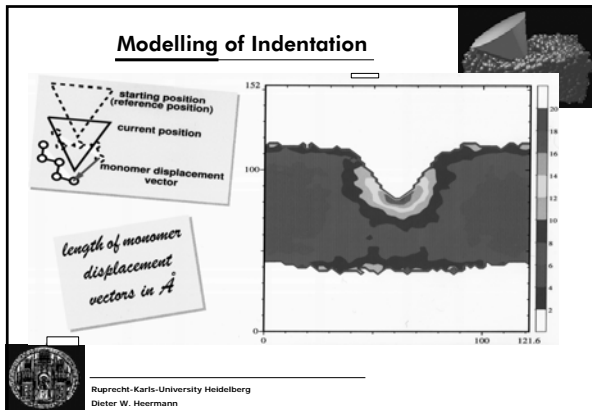



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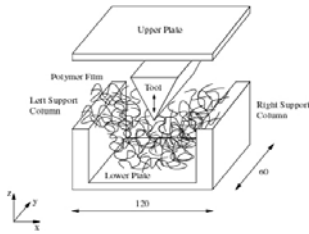
Modelling of Indentation

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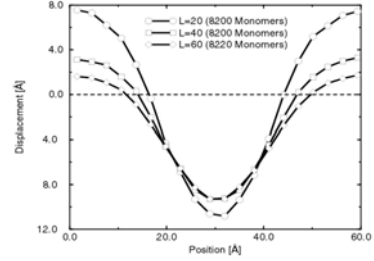


Modelling of Indentation: Bending



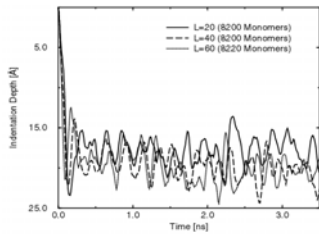
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Modelling of Indentation: Bending



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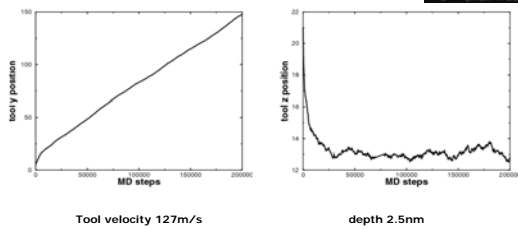
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Modelling of Scratching



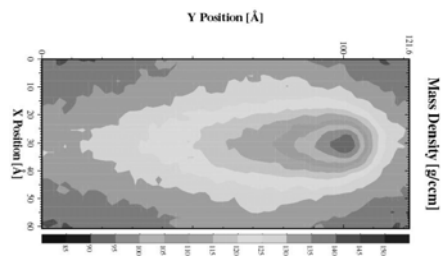
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Modelling of Indentation



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