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| | **Experiment title:**<br>Flow induced crystallization of iPPs: effect of flow strength, temperature and molecular architecture | **Experiment number**:<br>**26-02-267** |
| **Beamline**:<br>BM26B | **Date of experiment**:<br>from: 09 March 2005 to: 14 March 2005 | **Date of report**: |
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**Names and affiliations of applicants** (* indicates experimentalists):

Dr.ir Gerrit W.M. PETERS, Dr.Ir. Han GOOSSENS, Dr. Guido HEUNEN*, Dr. Denka HRISTOVA*, Ir. Luigi BALZANO*, Ir. Jan Willem HOUSMANS*, Dr. Reinhard FORSTENER*

TU/e - EINDHOVEN UNIVERSITY OF TECHNOLOGY

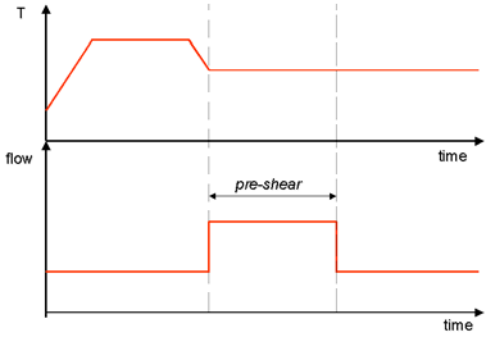
Den Dolech 2

5600 MB

Eindhoven – The Netherlands


**Report:**

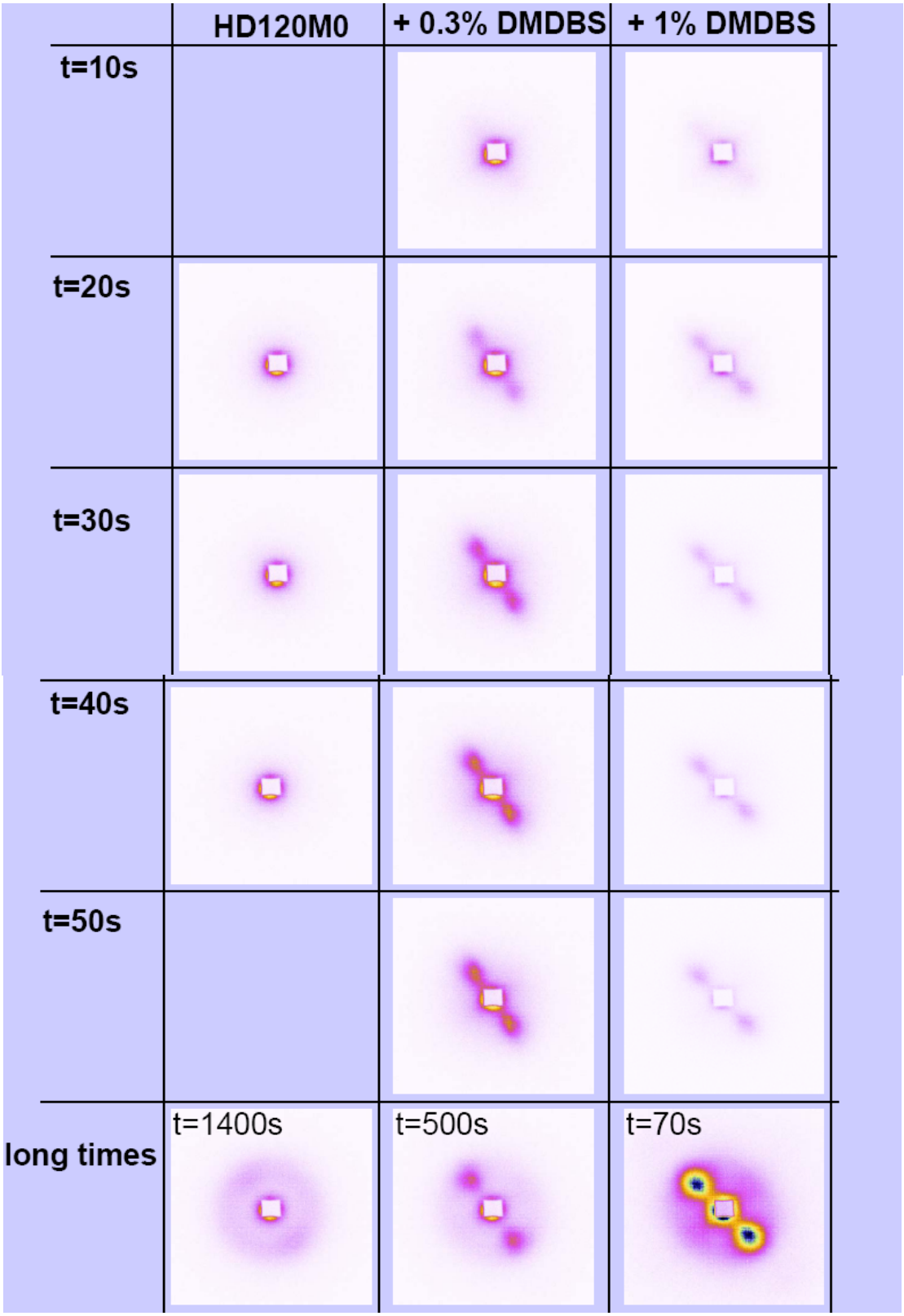
The crystallization properties of a commercial polypropylene melt (Borealis, HD120M0, chosen as a benchmark material available for interested groups), (a) modified with a commercial nucleation agent (DMDBS) and (b) a high molecular weight tail, have been investigated both at the structural and morphological level. Samples subjected to well controlled flow conditions are crystallized under isothermal conditions as schematcally depicted in the figure below.




**<u>Polypropylene with nucleation agent (DMDBS)</u>**

As shown in the figure below, where SAXS data is shown, the presence of relatively small amount of DMDBS has a big effect on degree of orientation and nucleation rate when shear

flow is applied ($60s^{-1}$ for 6s - at 145C). Three systems have been studied (0%, 0.3% and 1% DMDBS). By increasing the DMDBS content the phase transition occurs one decade faster and the orientation of the crystaline structures becomes much stronger.




**Polypropylene with a high molecular weight tail**

When a high molecular weight (HMW) tail is blended with the same polypropylene, the melt relaxation time specrtum is changed. The high molecular weight tail relaxes slower and this will lead to an increased degree of orientation, compared to the pure polypropene, when the same flow conditions are applied. The relaxation spectrum scales with temperature in a

Arrhenius-like way. Therefore, the “efficiency” of HMW tail in producing oriented structures is expected to be function of the temperature. Shearing ($60s^{-1}$, 6s) at 145C slightly affects the onset of the nucleation and has a relatively weak effect on the orientation (see figure below). When the temperature is lowered to 135C (see the figure below) the kinetics seems not to be affected by the presence of the HMW tail, but the orientation becomes stronger, i.e. more lamellae align perpendicular to the flow direction

Further data analysis is still in process and more features are being considered.