Identifying the non-local interactions of self-adhesive polymeric films with Digital Images of T-peeling

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ABSTRACT

Flexible polymer films with self-adhesive properties are widely used in different fields because of their modifiable properties. But one of the challenges with polyethylene films is the inherently poor surface adhesion or even complete adhesion failure. This poor adhesion of such films can be improved with surface modification methods such as cling layer coextrusion which can provide the self-adhesive properties for the film. To analyse and determine the delamination behaviour of such films, the interaction forces between the surfaces are required. Furthermore, to do these analyzations experimentally, T-peel test can be used to measure the required force for delamination of the film from a substrate. But due to the existence of different adhesive strength in different parts of the polymer films, as identified by [1], for the analyzation of the distributed forces and the process of delamination in detail, only a T-peel test is not reliable and a local traction-separation law is required.

To this end, a new feature of non-local interactions based on [2] was taken into account for modelling the adhesive forces of thin polymeric films with self-adhesion from an inverse path. The idea is to identify these interactions and determine their corresponding traction-separation curves from digital images of the deformed flexible films during the film delamination under T-peel test. The images of deformed shape of the films and the measured peel forces were the output data of the experiments. According to these images, which were taken perpendicular to the transverse view, the curvature shape of the films during the peel test can be calculated and inserted into the model for further analyzations to identify the properties of the adhesive layer with their corresponding traction-separation curves. The peel test experiments were performed on five different polyethylene films with different properties, to check the influence of every feature such as thickness of the film, the cling layer or the cling material on the traction-separation behavior of the films.

REFERENCES

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