Contribution ID : **35** Type : **Oral**

Maximum flux: Using time-resolved neutron reflectometry to improve our understanding of surface-initiated polymerisation

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Polymer brushes are dense arrays of surface-tethered polymers that possess desirable qualities, such as lubricity and fouling resistance, provided that their structure and chemistry are correctly tuned [1]. Surface-initiated polymerisation (SIP) is the primary method for synthesising these brushes with the physicochemical properties required to imbue surfaces with the aforementioned qualities. However, previous work [2,3] indicates that polymers synthesised by SIP deviate from polymers produced via solution polymerisation, likely due to the proximity of initiators in the tethered case. This deviation is not well understood, which impedes the structural characterisation of the resulting brushes. As structure dictates behaviour [1], understanding the nature of the brushes produced by SIP facilitates the rational design of functional brush coatings.

Here we present a study of brushes synthesised via SIP of the well-characterised polymer poly(N-isopropyl acrylamide) (PNIPAM) using time-resolved neutron reflectometry (NR). First, we demonstrate that we can control the polymer initiator density and examine the relationship between molecular weight and grafting density. We then observe a series of SIP reactions from surfaces with different initiator densities in situ using time-resolved NR. To our knowledge, this is the first time that the structure of a growing polymer brush has been directly observed. The results confirm that a high initiator density leads to poor control early in the reaction, and explain several phenomena observed by previous NR experiments [4,5]. This experiment paves the way for further kinetic experiments on Platypus and will be of interest to anyone interested in the dynamic assembly of interfaces over timescales of 10 minutes to several hours.

1. 10.1021/acs.macromol.7b00450
2. 10.1021/acs.macromol.5b02261
3. 10.1021/acs.macromol.7b01572
4. 10.1021/acs.macromol.6b01001
5. 10.1021/acs.langmuir.0c01502

Level of Expertise

Early Career <5 Years

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

No

Do you wish to take part in the Student Poster Slam

No

Condition of submission

Yes

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