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Molecular Understanding of the Dynamics of Supramolecular Polymers across different Length Scales

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Supramolecular polymers offer exciting prospects for materials with novel properties because of the reversibility of the non-covalent interactions, like H-bonding.[1,2] This work aims to unravel the correlation between H-bonding association and main chain polarity in supramolecular polymer melts. These are based on poly(ethylene)oxide (PEO) and poly(propylene)oxide (PPO) (in order of decreasing polarity) polymers possessing at the ends either the pair diaminotriazine (DAT) and thymine-1-acetic acid (THY) or 2-ureido-4[1H]-pyrimidinone (UPY) as H-bonding functional groups. A combination of rheology, DRS and NSE provided the association lifetimes for the supramolecular PEO and PPO functionalized with the pair THY/DAT.[2] The lifetimes for THY/DAT are the same for supramolecular PEO and PPO and independent of the chain polarity. SANS results reveal that while PEO and PPO functionalized with THY/DAT self-assemble as linear chains, PEO and PPO functionalized with UPY show phase separation with a cluster size of ~3 nm responsible for the physical crosslinks of the formed transient network.[2,3]

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[1] A.Brás, A.Arizaga, D.Sokolova, U.Agirre, S.Prévost, A.Radulescu, M.T.Viciosa, M.Kruteva, W.Pyckhout-Hintzen, A.M.Schmidt, Macromolecules, submitted.
[2] A.Brás, A.Arizaga, U.Agirre, M.Dorau, J.Houston, A.Radulescu, M.Kruteva, W.Pyckhout-Hintzen, A.M.Schmidt, Polymers, 2021,13, 2235.

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