Oscillatory carbonylation reaction employing mono- and di-alkyne-terminated poly(ethylene glycol)

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Carbonylation reactions are a direct route to synthesise carbonyl compounds.[1] The palladium-catalysed oxidative carbonylation of phenylacetylene gives rise to a number of products depending on the conditions[2] and attracts particular attention following the discovery of its oscillatory nature. Recently Donlon and Novakovic demonstrated that functional polymers can also act as substrates in oscillatory chemical reactions.[3] Both experimentally and in a modelling study, they showed that oscillatory pH behaviour can be reproducibly achieved *via* palladium-catalysed carbonylation of mono-alkyne-terminated poly(ethylene glycol) (PEGA). In this work, further studies of oscillatory behavior in pH using PEGA are reported. In addition di-alkyne-terminated poly(ethylene glycol) (PEGDA) is investigated as a substrate in oscillatory carbonylation reactions. In both PEGA and PEGDA oxidative carbonylation systems, oscillations in pH have been reproducibly recorded over a range of substrate concentrations.Observing initial substrate concentrations of PEGA and PEGDA used in this study, it may be noted that some are the same while some are two fold different. These are deliberately selected to enable direct comparison and evaluation of the effect the transition from mono- to di-alkyne substrate has on oscillatory behavior. Introduction of second alkyne group to polymer backbone significantly increased amplitude and period in pH oscillations. Further understanding of observed phenomena is the subject of ongoing studies.

1. Colquhoun, Thompson, Twigg, New York: Plenum Press; 1991; 2. Grosjean *et al.*, Journal of Molecular Catalysis A: Chemical, 2008. 3. Donlon and Novakovic, Chemical Communications, 2014; 4. Malashkevich *et al.*, The Journal of Physical Chemistry A, 1997; 5. Novakovic *et al.*, Chemical Physics Letters, 2007.