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Tuning the Crystallizability of Renewable Poly(alkylene 2,5-furan-dicarboxylate)s by *In-Situ* Adding Various Nanosized Nucleation Agents

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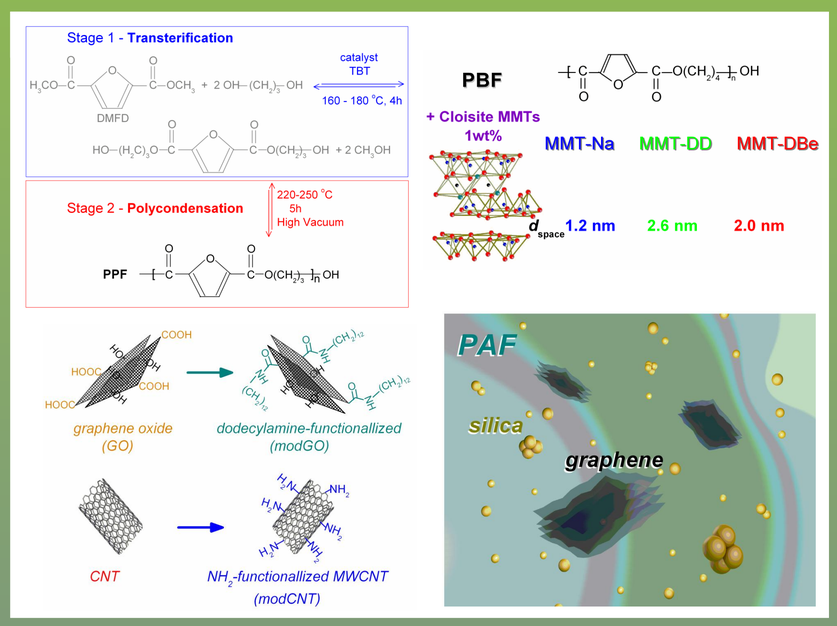
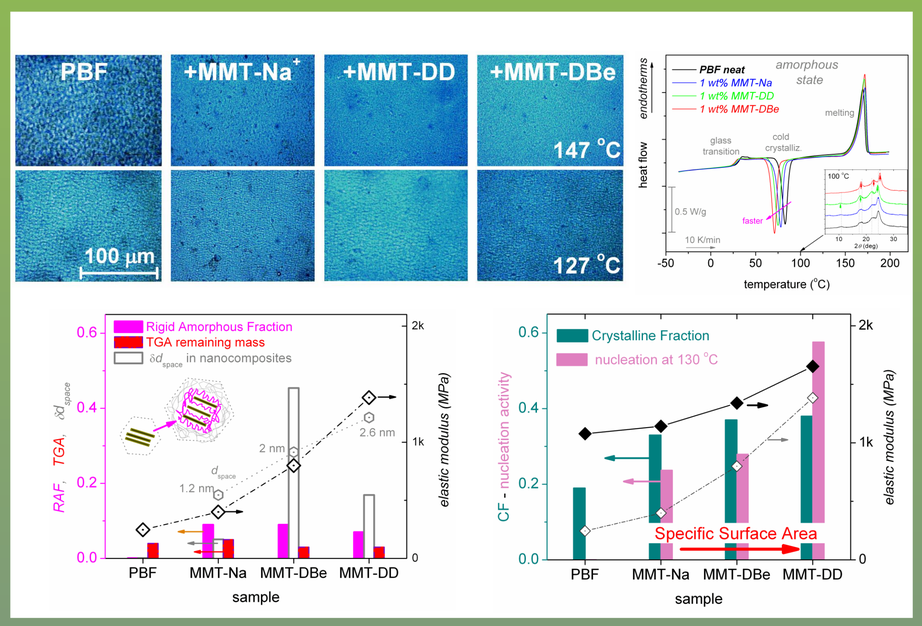
Bio-based and renewable poly(alkylene 2,5 furan-dicarboxylate)s (PAFs) [1,2] were synthesed, in the form of bulk polymers and nanocomposites, reinforced by the *in situ* introduction of a variety of inorganic nanofillers: MMT nanoclays [3], Graphene [4], carbon nanotubes (CNT) [5,6], halloysite nanotubes [5], graphene oxide [6] and silica [7]. The nanofillers were used both in the initial (natural) state and upon surface modifications, as well as in the forms of mixtures and hybrid particles. X-ray spectroscopy (XRD), Fourier transform infrared (FTIR) spectroscopy, differential scanning calorimetry (DSC), polarized light microscopy (POM) and broadband dielectric spectroscopy (BDS) were employed as characterization techniques. The fillers were found to enhance crystallization acting as additional nuclei, with the strength of this facilitation increasing systematically with the aspect ratio of the fillers [5]. Subsequently, this enhancement has lead to mechanical reinforcement [3-5]. Contrariwise, upon surface modification and development of strong polymer-particle interactions the nucleation action is hindered, which is demonstrated in PAFs for the first time [6]. As expected, crystallization, semicrystalline morphology and interfacial interactions impose strong impacts on molecular dynamics. Overall the results suggest that such materials serve quite well as tailor-made nanocomposites for targeted applications.

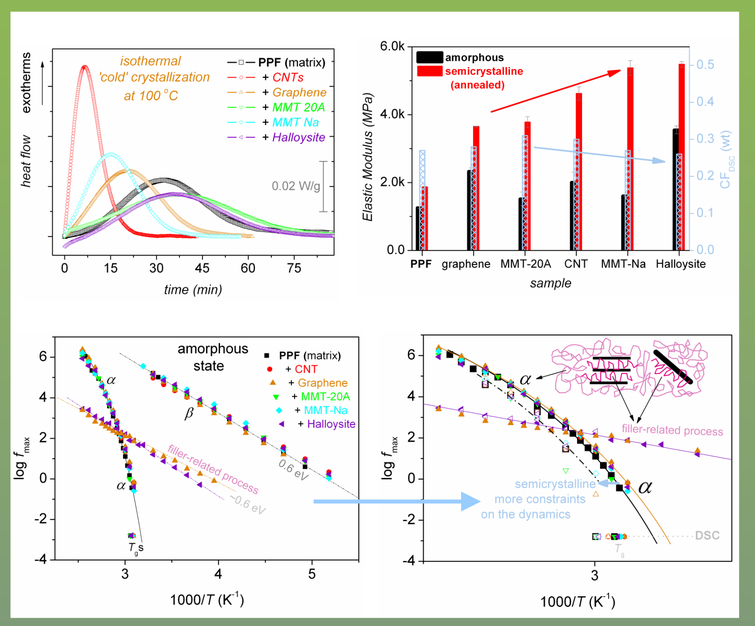
Materials – In Situ Nanocomposite Synthesis



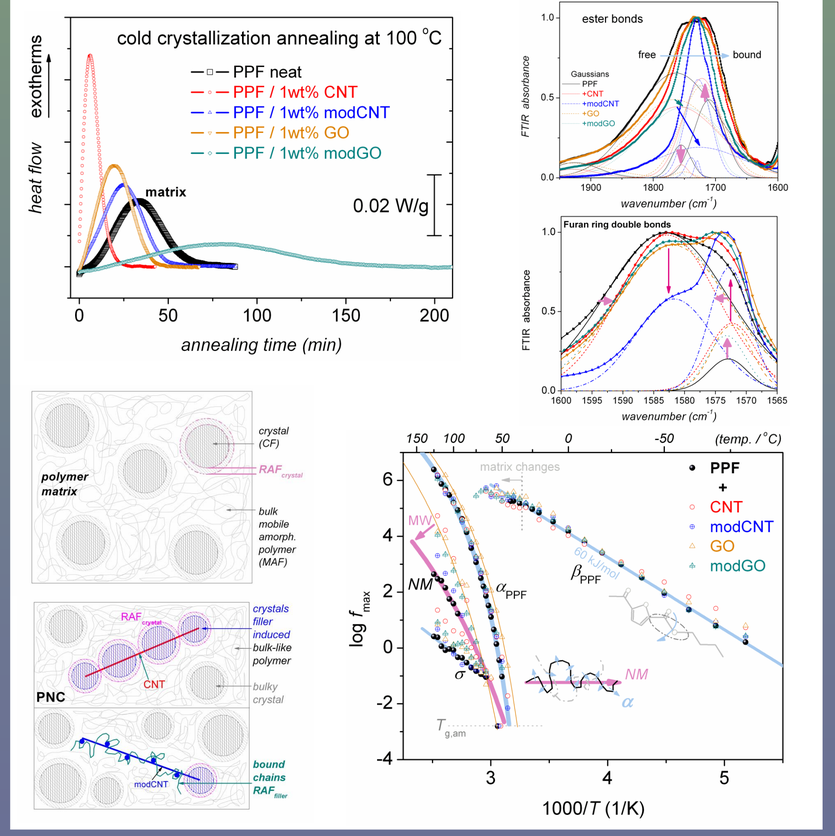
Poly(butylene furanoate) / nanoClays (MMT)



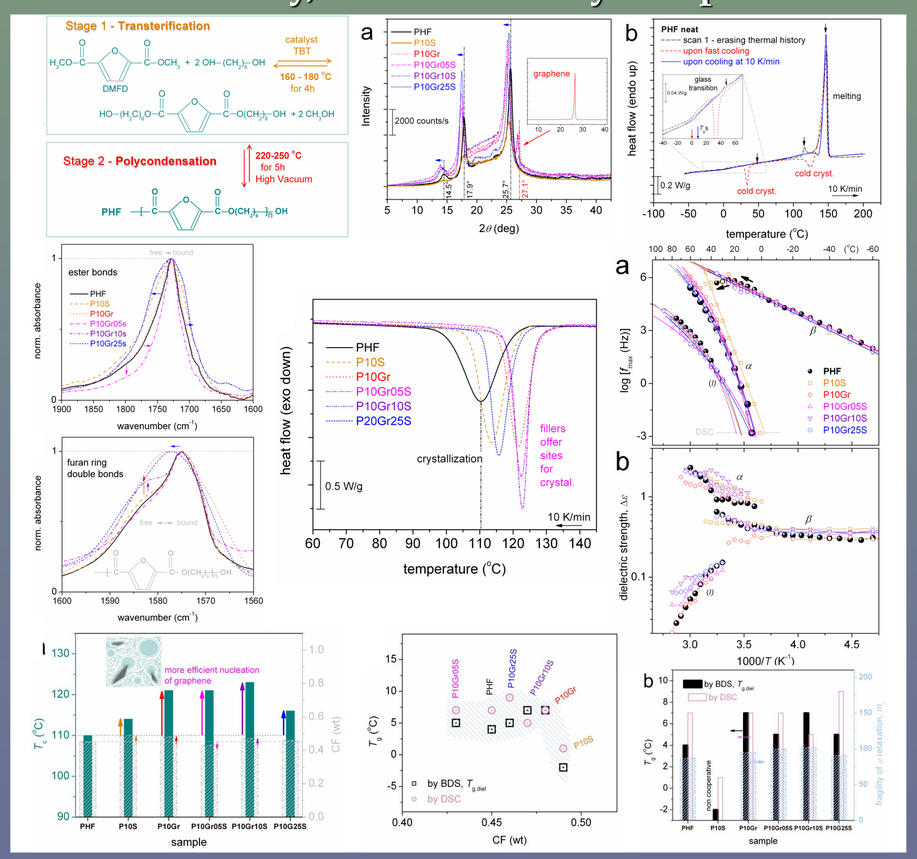
Poly(propylene furanoate) / 1-2D fillers



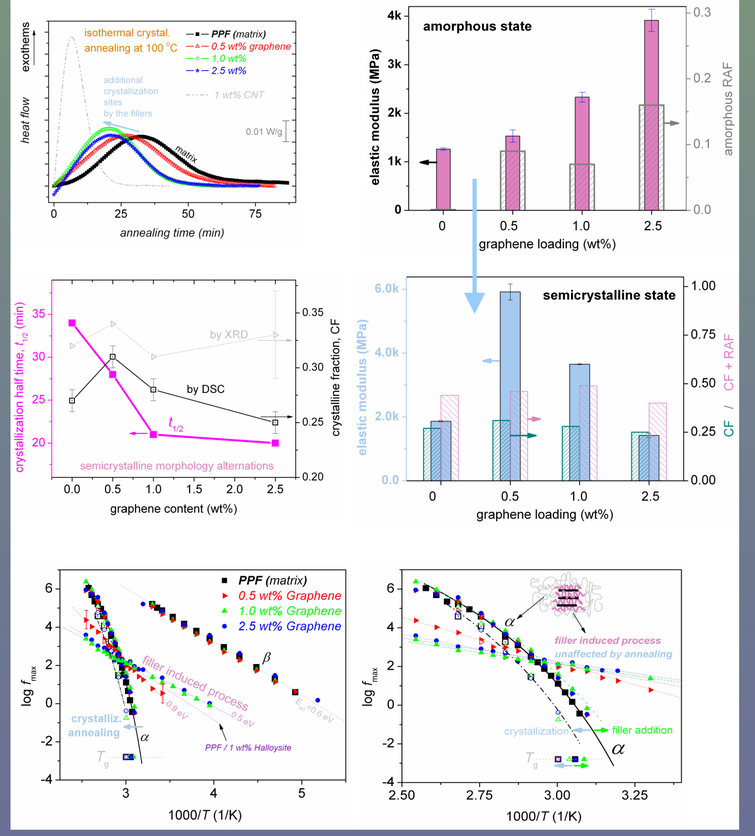
PPF / CNTs / Graphene Oxide
Modifications of the interfacial interactions



Poly(hexylene furanoate) / graphene-silica individually, mixture and Hybrid particles



PPF / graphene



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