

Mechanistic insights into the catalytic amination of polyethylenes

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Polyethylenes are ubiquitous commodity polymers that are used in a wide range of applications. Functional polyethylenes containing low percentages of functional groups possess unique bulk and surface properties, but the lack of diversity in structure and functionality of existing materials restricts their use to composite materials that are challenging to recycle. C–H functionalization of existing polyethylenes enables direct access to a broad range of otherwise inaccessible functional materials because the desired groups are installed onto preestablished polymer architectures. As such, catalytic methods for C–H functionalization of polyethylenes could serve as platforms to rapidly develop new materials for different applications. However, many methods for the functionalization of small alkanes do not translate to polyethylenes. We have recently developed a method for the C–H amination of polyethylene that required unique modifications to the Cu catalyst for amination to occur in high yields without deleterious side reactions. Mechanistic insights into the factors that affect the amination of polyethylene inform features of catalyst design that could enable the future development of other catalytic functionalizations of polyethylene.