

CREATING MICROPOROSITY WITHIN MACROPOROUS POLYMERS: A HYPERCROSSLINKING APPROACH

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Macroporosity within polymer bulk can be achieved by non monomer containing droplets emulsions with a high volume share of the droplet phase- termed high internal phase emulsions (1). If the concentration of droplets is high enough the resulting polymer from polymerising the monomer containing continuous emulsion phase has an interconnected macroporous structure with pore diameters between 1 μm and 50 μm , depending on the preparation conditions (2). First level of macropores are created due to the non monomer containing droplet phase template (thus term »emulsion templating« is used) while the second level of interconnecting pores are created due to phase density changes during the polymerisation and due to post polymerisation processing (purification and drying). Figure 1 depicts typical structure of emulsion templated polyHIPE material. Due to large dimensions of pores, polyHIPEs have rather low surface areas, typically around 10 m^2/g . However, using chemical post polymerisation crosslinking of polymer chains can result in the creation in meso and microporosity due to fixing of polymer chains at crosslink distance. For polyHIPE materials, this approach is of particular interest as it can yield polymers with a distinct hierarchical porous structure, good permeability and high surface area.

We have shown that both Friedel Crafts reaction and additional curing via a second radical source can be successfully applied to polyHIPEs and thus increasing surface area to over 1000 m^2/g (3,4). Applications of such type of polymers are expected in many fields requiring both small and large pores and applications in flow are particularly interesting.

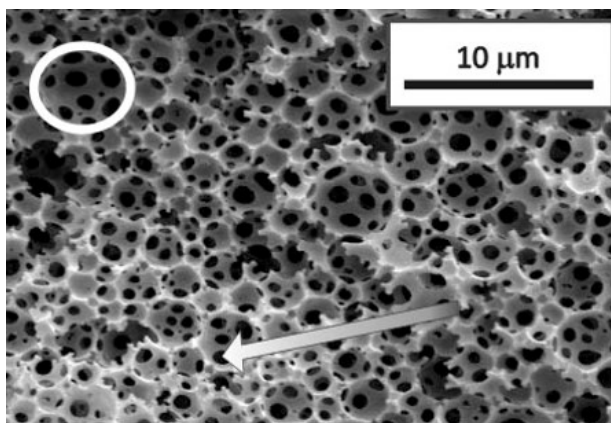


Figure 1: Scanning electron micrograph of a polyHIPE polymer with a depiction of first and second level pore

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