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Dangling chain effect on the modulus of polyurethane networks BRUNO FAYOLLE, JULIE DIANI, PIERRE GILORMINI, Arts et Métiers Paris-Tech — While the theory of elasticity has been well verified for the non ideal structures accounting for contribution of entanglements, some effort is needed to investigate the contribution of dangling chains. In order to establish a quantitative contribution of dangling chains, networks with a controlled architecture, i.e. where architecture is determined by synthesis of well-characterized reactants, are required. In this work, polyurethane networks based on poly(propylether) and poly(tetramethyl adipate) crosslinked by triisocyanate were prepared and studied. Different polyether molar masses are chosen from 430 g/mol up to 4000 g/mol. By varying the stoechiometric ratio r = [NCO]/[OH] between 0.4 and 1, dangling chains are introduced, provided that the reaction between NCO groups is negligible. After synthesis, the Young's modulus (E) of the networks has been measured from tensile tests according to the neo-Hookean law. The molar mass of elastically active network chains (ENAC) is determined from E. Since this molar mass is close to the molar mass of each diol used for synthesis at r=1 ("ideal" network), a correction taking into account the number of dangling chains (b) calculated from r is proposed.

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