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ABSTRACT**:** The hydrolytic stability of all-aliphatic polyurethane (PU) films made from polycarbonate-based aliphatic macrodiols (MD), diisocyanate-1,6-hexane and butane-1,4-diol (BD) were tested at 37 °C in phosphate buffer for a period up to 12 months. Two macrodiols, differing in composition and chain regularity and two MD-to-BD ratios were chosen for PU synthesis. The isocyanate-to-total hydroxyl ratio was kept constant and equal to 1.05. The functional properties of the original polyurethane films and films being immersed for 1, 3, 6 and 12 months in model physiological environment (37 °C at pH = 7.4) were studied on segmental up to macroscopic levels. The combination of SEM, AFM, FTIR, DSC, tensile and swelling analyses were used. It was found that prepared PU films are very good elastomeric materials with outstanding mechanical and suitable thermal properties keeping these properties practically unchanged for a period of up to 12 months. They can be practically used for example as strong and durable topcoats.

Keywords: polyurethane, elastomer, hydrolytic stability, surface analysis, mechanical properties, thermal properties