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Self-healing of polymeric materials: The effect of the amount of DCPD confined within microcapsules[1] DORINA M. CHIPARA, ALMA PEREZ, KAREN LOZANO, IBRAHIM ELAMIN, JAHAZIEL VILLARREAL, ALFONSO SALINAS, MIRCEA CHIPARA, The University of Texas Pan American — The self-healing SH) of polymers is based on the dispersion of a catalyst and of microcapsules filled with monomer within the polymeric matrix. Sufficiently large external stresses will rupture the microcapsule, releasing the monomer which will diffuse through the polymer and eventually will reach a catalyst particle igniting a polymerization reaction. The classical SH system includes first generation Grubbs catalyst and poly-urea formaldehyde microcapsules filled with DCPD. The polymerization reaction is a ring-opening metathesis. The size and the mechanical features of microcapsules are critical in controlling the SH process. Research was focused on the effect of DCPD on the size and thickness of microcapsules. Microscopy was used to determine the size of microcapsules (typically in the range of 10^{-4} m) and the thickness of the microcapsules (ranging between 10^{-6} to 10^{-8} m). Research revealed a thick disordered layer over a thin and more compact wall. Raman spectroscopy confirmed the confinement of DCPD, TGA measurements aimed to a better understanding of the degradation processes in inert atmosphere, and mechanical tests supported the ignition of self-healing properties.

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