

The Response of the Polymer PDDA and of PDDA/Clay Nanocomposites (Artificial Nacre) at Low and High Strain Rates

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Films of nanostructured artificial nacre are synthesized via the sequential deposition of organic and inorganic layers in a process known as layer-by-layer (LBL) assembly [1]. The two layers used in the LBL assembly are polydiallyldimethylammonium chloride (PDDA) and 0.9 nm thick montmorillonite clay platelets. The platelets become oriented parallel to the film surface during the LBL process, resulting in a high degree of in-plane orientation of the nanostructure that physically resembles the architecture of nacre. The mechanical response of these relatively new materials has not been characterized, especially for high strain rate applications. In this talk, the stress-strain response of both the unfilled PDDA polymer and the artificial nacre will be characterized at low and high strain rates using servohydraulic and split Hopkinson pressure bar apparatus. Additional tests via high rate pressurization of the polymer and nanocomposite films will be conducted to examine the toughness of these materials at high strain rates.

References

[1] P. Podsiadlo, S. Paternel, J-M. Rouillard, Z. Zhang, J. Lee, J-W. Lee, E. Gulari and N. A. Kotov, "Layer-by-Layer Assembly of Nacre-Like Nanostructured Composites with Antimicrobial Properties," *Langmuir* **21**, 11915-11921, 2005.

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