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**Advances in
Nanotechnology and
its Applications**

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ADVANCES IN NANOTECHNOLOGY & ITS APPLICATION

EDITORS

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CHAPTER 3

Fatigue and Fracture in PVC/CaCO₃ Nanocomposites

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Introduction

Over the past 50 years the materials for piping application has gradually changed from metal or concrete based materials to plastics. The most common plastic used in water systems is polyvinyl chloride (PVC). It is used to transport not only clean water in municipal system but also waste water in sewage system as well. PVC offers many benefits over the conventional piping materials such as corrosion and chemical resistant, cost, durability and ease of use. For pumped water systems and rising sewer mains, during its services the plastic pipes are exposed to frequent pressure fluctuation or cyclic loadings. Comparable to other thermoplastics, PVC will fatigue under cyclic or fluctuating stresses. In this case, it may fractures even if the applied stresses are lowered than the ultimate strength of the PVC. Hence, the fatigue plastic pipes could cause the pipes to failure or bursting that eventually lead to loss of water, structural damage to roads and building and disruption of other services.

Concern about the fatigue behavior of PVC pipes has increased since the occurrence of premature failure of these pipes in 1970s. In fact, thoroughly investigations found out that the failure was associated with poor installation practices, inappropriate pressure class and poor quality of pipes. Nevertheless since that incidence, the fatigue behavior is one of the primary considerations in designing PVC pipes particularly for water distribution