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Function Scale Integration - Embedding Sensors in Materials for Structural Health Monitoring

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Embedding sensors for structural health monitoring (SHM) confronts us with two opposing challenges: First, we want reliable data with high spatial resolution from the inside of a material. Second, a sensor is a foreign object, a "wound" in the material which may downgrade its properties. This paper discusses ideas to integrate sensors in material without changing its macroscopic performance to the worse.

First, the paper describes the impact of miniaturization on sensors. It is our idea to reduce the volume of the sensor to the minimum which is needed to guarantee the function. This approach is called function scale integration. The impact of size on sensitivity and noise is discussed at the example of an acceleration sensor.

Finally, the paper describes a new thin and flexible foil sensor which can monitor the process of polymerization of a compound material. This sensor is a first step in the direction of function scale integration. Possible further development is discussed.

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Ключевые слова:

Содержание

Abstract

Introduction

How to integrate sensors

How small can a sensor be?

An example: embedding sensors in carbon fibre compounds

Outlook