Classification of post-earthquake building waste through Hyperspectral imaging approach

G. Bonifazi[1,2], G. Capobianco[1], S. Serranti[1,2], O. Trotta[1]

[1]Department of Chemical Engineering Materials & Environment. Sapienza – University of Rome, Via Eudossiana, 18, 00184 Roma, Italy
[2] Research Center for Biophotonics, Sapienza – University of Rome, Corso della Repubblica, 79, 04100, Latina, Italy

Presenting author email: oriana.trotta@uniroma1.it

Abstract

Post-earthquake building waste (PBW) management and recovery is a crucial aspect to manage because natural disasters produce a large amount of waste composed of heterogeneous materials, including construction and demolition waste (CDW) and hazardous materials. The inert components of PBW have a high potential for recycling and reuse, and they can represent an essential resource, if adequately separated, as secondary raw materials. This work aims to present the utilization of hyperspectral imaging to define the most accurate and reliable strategy for the automatic detection and sorting of different types of inert (e.g., concrete, brick, ceramic material, etc.). Principal Component Analysis (PCA) was applied to reduce the data dimension. A Support Vector Machine-Discriminant Analysis (SVM-DA) was adopted to build an efficient classifier. The results have been evaluated in terms of prediction maps and statistical parameters. Results showed that it is possible to recognize and classify PBW materials, distinguishing different types of materials, despite their very similar compositions. The achieved results represent an essential starting point for developing innovative strategies finalized to design, implement and set up automatic recognition and classification procedures of inert fractions. Moreover, this approach can also be applied to the quality control of recycled materials. The system could play a fundamental role in the recovery of PBW and efficient recycling management in post-earthquake areas.

Keywords: Post-earthquake Building Waste (PBW); Construction and Demolition Waste (CDW); Hyperspectral imaging (HSI); Support Vector Machine-Discriminant Analysis (SVM-DA)