

Monitoring of metal powder by eddy current

Ahmed HADDAD, Mourad ZERGOUG, Mohamed Azzaz, Abdelhamid Tafat, Said Bergheul

Abstract: Nanocrystalline $\text{Fe}(1-x)\text{Co}_x$, Fe, $\text{Fe}_{80}\text{Ni}_{20}$, $\text{Cu}_{70}\text{Fe}_{18}\text{Co}_{12}$ mixtures have been prepared by mechanical alloying using a planetary ball mill under several milling conditions. Their structures and magnetic properties were investigated. Mechanical alloying is a non-balanced process for synthesis materials. The structural effects of mechanical alloying of powders were investigated by scanning X-ray diffraction analysis. In this report, we examine the applicability of eddy current techniques in-process for monitoring of powder density particle size and the time necessary to structure variation. An eddy current based monitoring system developed to measure metal powder density is expanded for monitoring metal powder diameter in metal compounds. Experimental sensor readings were gathered using four different metal powders with known particle sizes $\text{Fe}(1-x)\text{Co}_x$, Fe, $\text{Fe}_{80}\text{Ni}_{20}$ and $\text{Cu}_{70}\text{Fe}_{18}\text{Co}_{12}$. Analysis of the data showed that the sensor output was in relation with different parameter of powder (diameter, density and structure) that the sensitivity of the sensor differed with the type of metal powder. The merit of this technique is its reliance on a simple and inexpensive sensor probe.

Keywords : metal powders, Mechanical Alloying, Magnetic Properties, Eddy Current, NDT, nondestructive testing, process monitoring, nanocrystalline materials, planetary ball milling, powder density, particle size, structure variation, sensors, sensor probes, nanostructures, nanotechnology.