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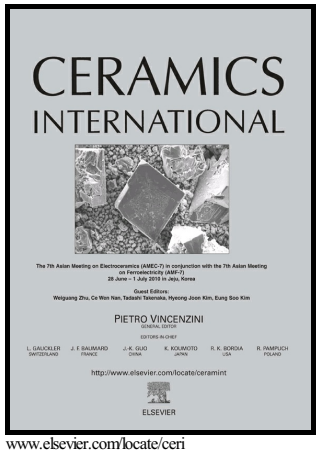

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Detection of deformation induced electromagnetic radiation from cement-barium titanate composite under impact loading

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Abstract:

Electromagnetic radiation (EMR) responses from cement–$BaTiO_3$ (BT) composites under impact loading have been presented in this paper. The bulk density, dielectric constant and piezoelectric charge coefficient of the cement-BT composites are observed to increase while the loss tangent decreases with increase in BT content in the composites. Measurements have been carried out using cylindrical, semi-cylindrical and quarter cylindrical antennae. Marked enhancement in the values of EMR voltage for all experiments at different heights of impact and with different antennae is observed as the content of BT is increased from 5% to 40 % in the cement–BT composites. The EMR voltage increases, respectively from 0.58 V to 1.16 V, 384 mV to 732 mV and 259 mV to 520 mV for cylindrical antenna, semi-cylindrical antenna and quarter cylindrical antenna with the increase in BT content from 5% to 40% in cement–BT composites at the same level of impact (height of impact = 21 cm). Also average EMR energy release rate increases from 0.00007 V^2–sec/sec to 0.00047 V^2–sec/sec, 0.000065 V^2 – sec/sec to 0.000214 V^2 – sec/sec and 0.000032 V^2 – sec/sec to 0.000135 V^2 – sec/sec with the increase in BT content from 5% to 40% in cement–BT composites impacted from a height of 21 cm as measured by cylindrical

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