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Inoculation of ductile iron using a locally produced biomass inoculant for pipeline application

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Among the important engineering materials is ductile iron which is also used in the manufacture of pipes that are extensively used in oil and gas, including water supply industry for fluids transportation respectively. The addition of locally produced biomass inoculant to ductile iron melt can alter its metallic properties positively to aid its extensive or alternative application in the petroleum industry in place of steel. Therefore, this work investigated the potential of cocoa beans shell powder to be used as an effective inoculant for improving the microstructure and mechanical properties of ductile iron and also achieve conversion of waste to wealth cum mitigation of environmental pollution. The assessed properties include; microstructure, mechanical hardness, and impact resistance. The locally produced biomass used as the inoculant is cocoa bean shells in its powder form. Three sets of test samples were produced using green sand moulding process, with each melt of 10kg having a specified quantity of the locally produced biomass inoculant of micron size ranging from 600 - 850micron added to it. Another three sets of samples were produced using 24kg of FeMgSi (conventional inoculant) per 500kg of ductile iron melt. The results of samples inoculated with locally produced inoculant were evaluated and then compared with the results of the sets of samples that were inoculated with the conventional inoculant (FeMgSi). Ladle inoculation method was adopted for all sets of samples. There was anomaly in the microstructural examination which showed that the grain size increased irregularly with increase in addition of the locally produced biomass inoculant. The mechanical properties (hardness and impact resistance) increased as more of the locally produced biomass inoculant was added. The overall results showed that the used locally produced biomass inoculant has the capability of altering the microstructural and mechanical properties of ductile iron.

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