ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 12, pp.43935-43937, December, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

EFFECT OF REINFORCEMENT OF STONEDUST IN RECYCLED POLYMER ON ITS THERMAL PROPERTIES

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ARTICLE INFO

Article History:
Received 11th September, 2016
Received in revised form
22nd October, 2016
Accepted 16th November, 2016
Published online 30th December, 2016

Key words:

Polymer Blend, filler, Differential Scanning Calorimetry (DSC), Tg, Tm.

ABSTRACT

Societies contantly facing Plastic solid waste (PSW) challenges and finding opportunities of their sustainability awareness and technological advances. Stonedust used as reinforcing material (filler) with addative stearic acid for processing. Stonedust added with recycled polymer in different proportions and its effect as a filler on thermal properties of recycled polymer was studied using Differential Scanning Calorimetry (DSC) test. Addition of stonedust not disturbed its remarkable thermal properties and shows negligible effect of binder on Tg and Tm values.

Citation: Shubhangi Satdeve, Dr. Mahendra D Choudhary and Dr. D.K. Aggarwal, 2016. "Effect of reinforcement of stonedust in recycled polymer on its thermal properties", *International Journal of Current Research,* 8, (12), 43935-43937.

INTRODUCTION

In many developing countries, plastics are disposed of through landfilling or through open, uncontrolled burning which produces environmental hazards. Stonedust captured from stone crushers acts as a air pollutant causes various imperative health problems. Macroparticals of stonedust captured with recycled polymer as an alternative of the serious environmental problem of the disposal of stonedust and polymer. This project is based upon combination of stondust and recycled polymer in different proportions using stearic acid as a binder during processing. In this paper, we report the results of our investigations on the detection and quantification of these polymers using DSC (Differential Scanning Calorimetry).

MATERIALS AND METHODS

The samples of model polymers and stonedust used in these experiments were obtained from commercial sources. 45 mand 25 micron-size particals of stonedust separated by using respective size diameter sieve. Reinforcement of stondust with recycled polymer for preparing test specime was carried out in screw extruder by using 2% stearic acid as a processer. Adjusting different proportions total eight test specimens were prepared as mentioned in Table 1.

Table 1.

	Specimen code	Recycled polymer %	Stone Dust % 25µm	Stearic Acid %
Type -I	RPSDA -1	95	5	2
	RPSDA -2	90	10	2
	RPSDA -3	85	15	2
	RPSDA -4	80	20	2
	Specimen code	Recycled polymer %	Stone Dust % 45µm	Stearic Acid %
Type -II	RPSDB -1	95	5	2
	RPSDB-2	90	10	2
	RPSDB-3	85	15	2
	RPSDB-4	80	20	2
	Blank	100	-	-

Characterization

Characterization of 9 test specimens were carried out by using DSC test using Toshvin (Detector:DSC-60) in nitrogen atmosphere with a flow rate of 50[ml/min] from pune university.

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Graphical Representation

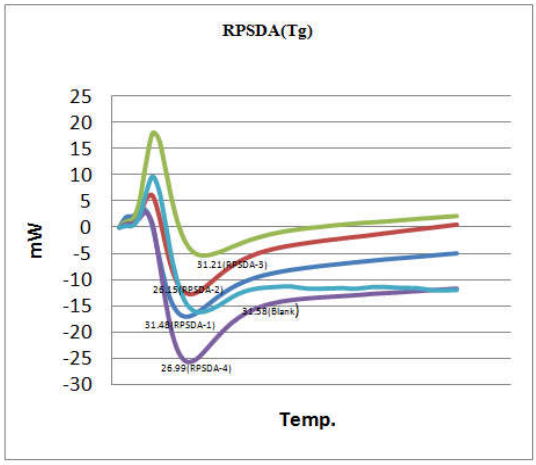
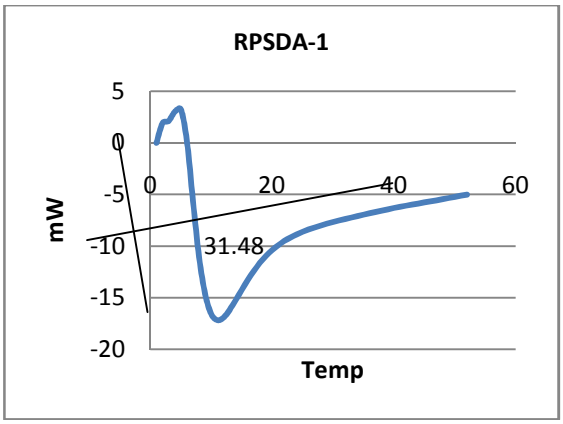
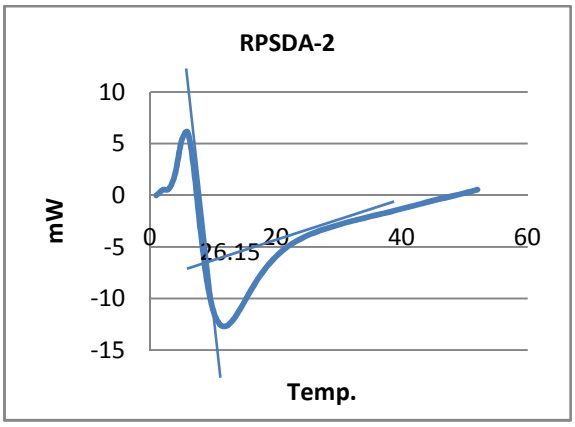
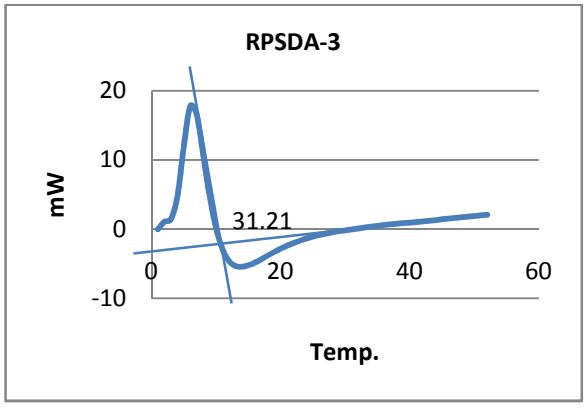
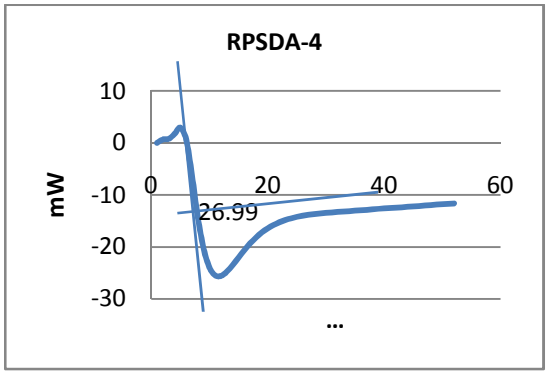


Figure 1. DSC curves for Type A evaluate comparative Tg values of samples RPSDA-1, RPSDA-2, RPSDA-3, RPSDA-4 with blank respectively









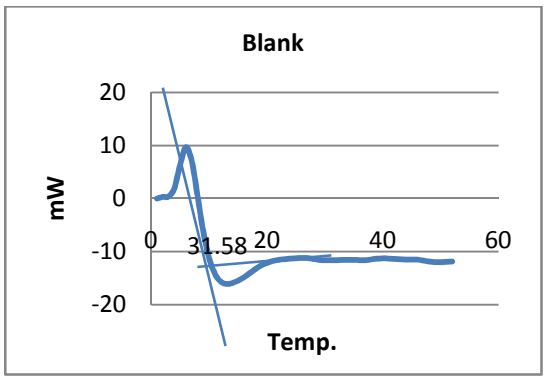


Figure 2. Graphs showing Tg value calculation of samples RPSDA-1, RPSDA-2, RPSDA-3, RPSDA-4 with blank respectively. Tg values found to be obtained by intercepting two curves with straight line

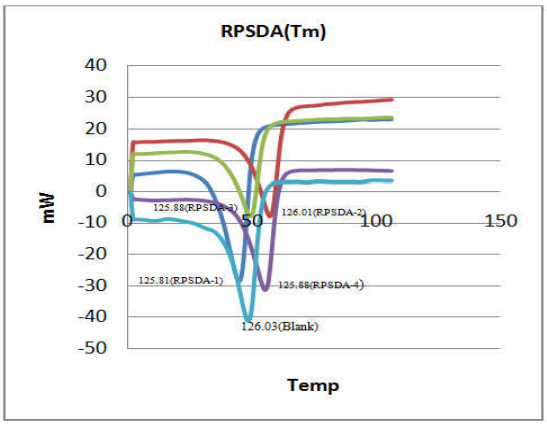


Figure 3. DSC curves for Type A evaluate comparative Tg values of samples RPSDA-1, RPSDA-2, RPSDA-3, RPSDA-4 with blank respectively

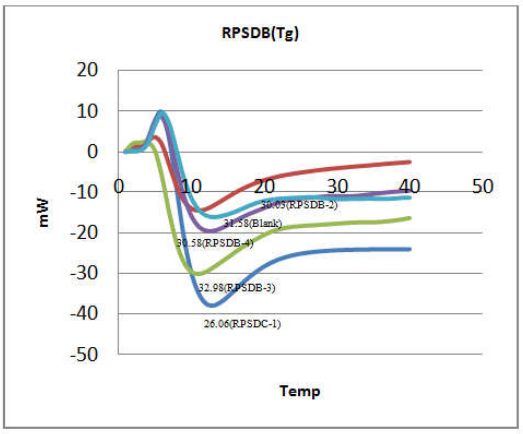


Figure 4. DSC curves for Type B evaluate comparative Tg values of samples RPSDB-1, RPSDB-2, RPSDB-3, RPSDB-4 with blank respectively

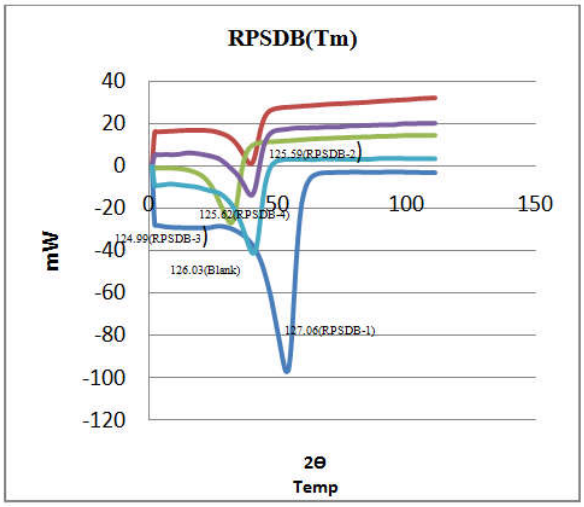


Figure 5. Graphs showing Tg value calculation of samples RPSDA-1, RPSDA-2, RPSDA-3, RPSDA-4 with blank respectively. Tg values found to be obtained by intercepting two curves with straight line

RESULTS AND DISCUSSION

Tg amd Tm values calculated from graph plotted from DCS values and tabulated for conclusion using table no 2

Table 2.

Specimen code	Tg	Tm
RPSDA -1	31.48	125.81
RPSDA -2	26.15	126.01
RPSDA -3	31.21	125.88
RPSDA -4	26.99	125.88
RPSDB -1	26.06	127.06
RPSDB-2	30.03	125.59
RPSDB-3	32.98	124.99
RPSDB-4	30.58	125.62
Blank	31.58	126.03

Conclusion

1. This work is mainly related with successfully utilization of recycled polymer with stonedust for mechanical property improvement.
2. Tg and Tm values slightely decreases but not shows remarkable change in values due to addition of stonedust.
3. Utilization of stonedust and recycled polymer definitely reduced solid pollution.
4. The experimental data shows amorphous nature, flexibility and cost reduction of new product (Polymer composite).
5. Due to increase in flexibility polymer composite can be converted to desired products according to its applicability.

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