

# ASSESSMENT OF SELF-COMBUSTION RISKS FOR SOLID FUELS

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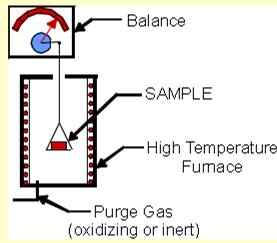
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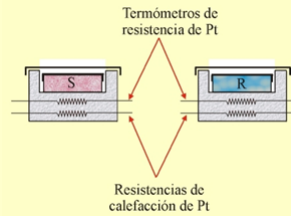
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## Experimental techniques:

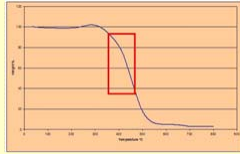
### Thermogravimetric analysis TG



### Differential Scanning Calorimetry DSC



### Thermal susceptibility evaluation Ea, T<sub>caract</sub>

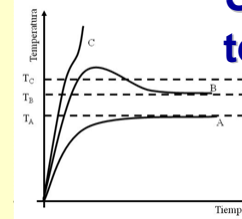
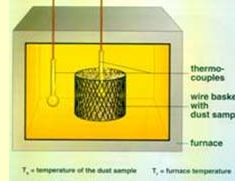


Activation energy

$$\ln\left(-\frac{1}{w} \frac{dw}{dt}\right) = \ln A - \frac{Ea}{RT}$$

Characteristic temperature

### Self ignition temperature TAI

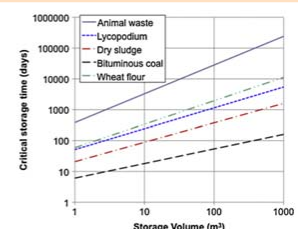
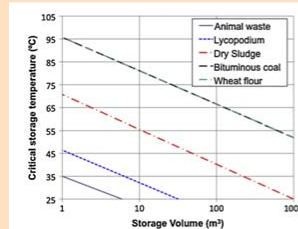
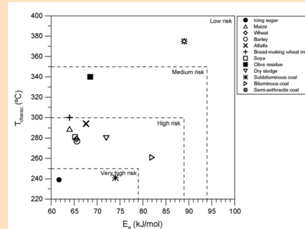
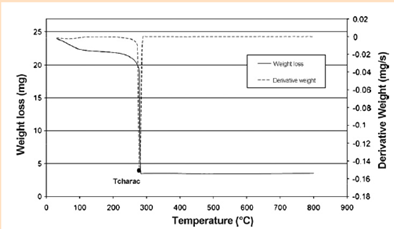
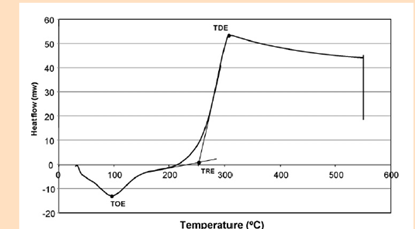
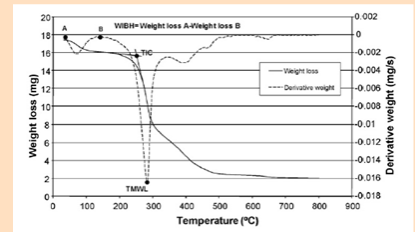


## Results:



Material	TG			DSC		
	WIBH (mg)	TMWL (°C)	TIC (°C)	TOE (°C)	TDE (°C)	TRE (°C)
Icing sug	0	220	212	243	480	410
Maize	0	279	268	100	386	242
Wheat	0	283	252	95	283	252
Barley	0	271	242	80	311	257
Alfalfa	0	276	231	92	288	240
Bread-m	0	282	277	103	341	271
Soya	0	265	225	97	306	245
Lycopodi	0	282	235	83	314	213
Olive res	0	270	245	100	310	240
Dry sludg	0	290	230	95	300	220
Animal v	0	300	180	80	370	-
Subbitun	0	365	318	102	291	220
Bituminic	3	407	392	71	323	240
Semi-ant	2.3	501	303	73	406	265

Material	E <sub>a</sub> (kJ/mol)	T <sub>charac</sub> (°C)
Icing sugar	61.7	239
Maize	64.0	289
Wheat	65.5	279
Barley	65.6	277
Alfalfa	67.6	294
Bread-making flour	64.0	300
Soya	65.2	281
Lycopodium	67.7	332
Olive residue	68.5	340
Dry sludge	72.0	280
Animal waste	73.0	280
Subbituminous coal	74.0	241
Bituminous coal	82.0	261
Semi-anthracite coal	89.0	375



Basket volume (cm <sup>3</sup> )	Lycopodium		Bituminous coal		Animal waste		Dry sludge		Wheat dust	
	SIT (°C)	t (min)	SIT (°C)	t (min)	SIT (°C)	t (min)	SIT (°C)	t (min)	SIT (°C)	t (min)
50	145	64	185	51	145	36	170	51	187.5	44
150	130	155	175	73	130	71	155	63	177.5	92
350	120	276	165	156	115	400	145	109	167.5	196
1500	105	629	150	238	100	411	130	381	152.5	462

## Conclusions:

- The present results provide information important for preventing the onset of exothermic oxidation processes and self-heating in the dusts of different materials.
- Thermal susceptibility analysis (TG and DSC tests) offers advantages over thermal stability analysis in terms of the very much smaller sample sizes and shorter test times required.
- The isothermal oven method provided sufficient quantitative information to determine the self-ignition behavior of the present samples.
- Thermal stability results should be interpreted with care since they involve extrapolation.