

Chemical characterisation of PM₁₀ emissions from common Portuguese tree species in a wood burning stove

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A recent study has pointed out residential wood combustion as a major contributor to particulate pollution in Europe during winter (Legrand & Puxbaum, 2007). One goal of detailed analysis of biomass burning emissions is the potential use in receptor models for particulate matter source apportionment. Since the distribution of compounds emitted differs by species and burning conditions and there are many variations among published profiles (e.g. Fine *et al.*, 2004; Schmidl *et al.*, 2008), it is desirable to obtain specific data at a regional level on the chemical characterisation of wood smoke.

To characterise the PM₁₀ emissions from wood stoves and compare the emission profiles to those obtained from previous experiments in other countries, a series of source tests were carried out on the burning of some of the most prevalent Portuguese tree species (Table 1). Analysis of the wood smoke included particle mass emission factors and the determination of its carbonaceous content (OC/EC) by a thermal optical technique (Carvalho *et al.*, 2006). The trace metal speciation has been performed by ICP-OES and XRF (Schmidl *et al.*, 2008). Radionuclides have been measured by α -spectrometry (Carvalho *et al.*, 2007). PM₁₀ samples were also analysed for the main water-soluble ion species.

Table 1. Portuguese tree species selected for wood stove combustion tests

Tree species	kha forest	% cover	Moisture (%)
<i>Pinus pinaster</i>	911	27.3	38.5
<i>Eucalyptus globulos</i>	541	16.3	41.6
<i>Quercus suber</i>	331	9.9	41.2
<i>Acacia longifolia</i>	19	0.6	41.5

Results suggest that eucalyptus and oak contribute with similar PM₁₀ (Figure 1) and carbonaceous emissions (Table 2), while pine and acacia smoke present some resemblances. The comparison of chemical profiles from this study with

literature showed quite different concentrations, in spite of some qualitative similarities.

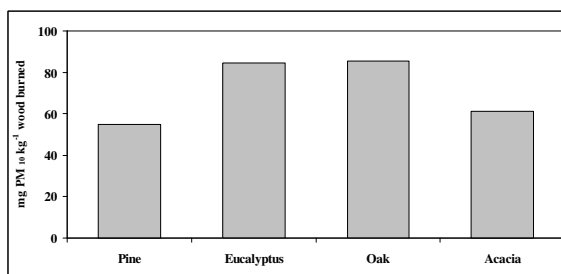


Figure 1. PM₁₀ emission factors from the combustion of Portuguese tree species in a stove

Table 2. Emission factors for wood stove combustion (w/w % of PM₁₀)

	OC	EC	OC/EC
Pine (sw)	26±10	37±12	0.9
Eucalyptus (hw)	32±5	13±8	3.1
Oak (hw)	43±2	11±4	4.4
Acacia (hw)	20±10	25±10	1.0
Ref. (a)	41-55	10-31	1.3-5.7
Ref. (b)	51-59 (hw) 44-78 (sw)	3-23 (hw) 8-22 (sw)	2.6-17.3 (hw) 3.0-10.2 (sw)

(sw) – softwood; (hw) – hardwood; (a) Schmidl *et al.* (2008); (b) Fine *et al.* (2004)

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