BROMINE CONTAINING NAPHTHALIMIDES EXHIBITING ROOM-TEMPARETURE PHOSPORESCENCE

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Introduction

Phosphorescence is generally known as the radiative transition between two states with the different spin-multiplicities. This phenomenon is often observed for inorganic materials and organometallic complex materials [1]. Recently, room-temperature phosphorescence (RTP) from pure organic materials has attracted great attention owing to its various functional applications in organic light-emitting diodes, digital security, optical recording devices, sensors, for bioimaging etc. [2]. Since phosphorescence originates because of a spin-forbidden transition, decay times of phosphorescence (10^{-6} to 10^{-2} s) are typically longer than those of fluorescence (10^{-9} to 10^{-7} s) [3]. The aim of this work was study of thermal and photophysical properties of bromine disubstituted naphthalimides

Structures of the compounds

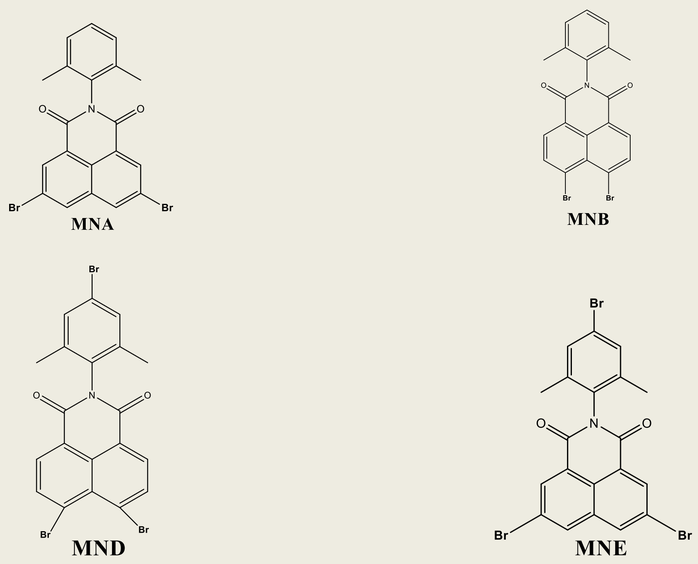


Fig.1 Sructures of the synthesized naphthalimide derivatives

Thermal characteristics

Name	T_m[a], °C	T_g[b], °C	T_d[c]-5%, °C	T_{cr}[d], °C
MNA	268	-	485	235
MNB	220	-	419	184
MND	249	-	420	175
MNE	261	103	320	164

a. Melting point **b.** Glass transition temperature observed at the first DSC heating scan . **c.** 5% weight loss temperature obtained from TGA curves. d. Crystallisation temperature observed from in cooling scan

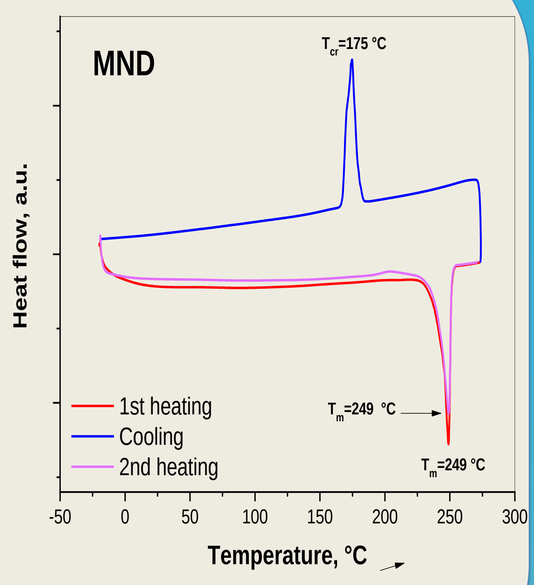
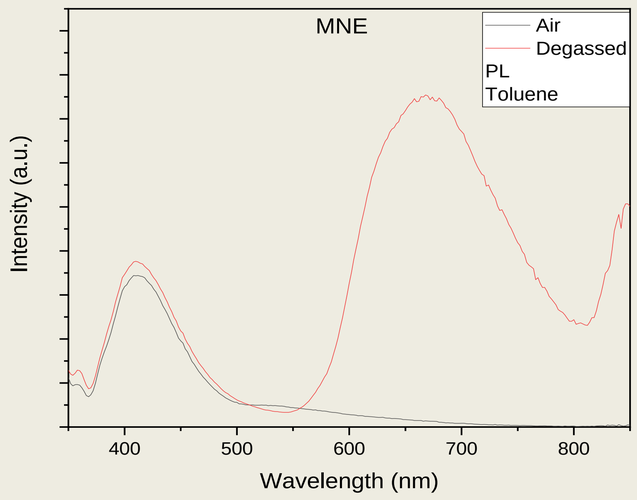


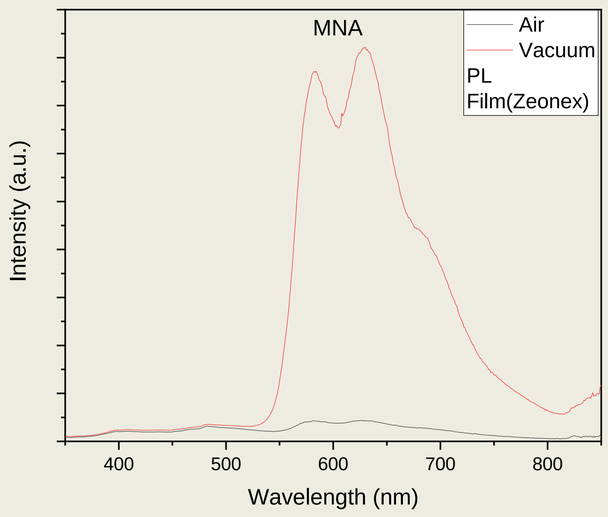
Fig.2 DSC curves of **MND** material

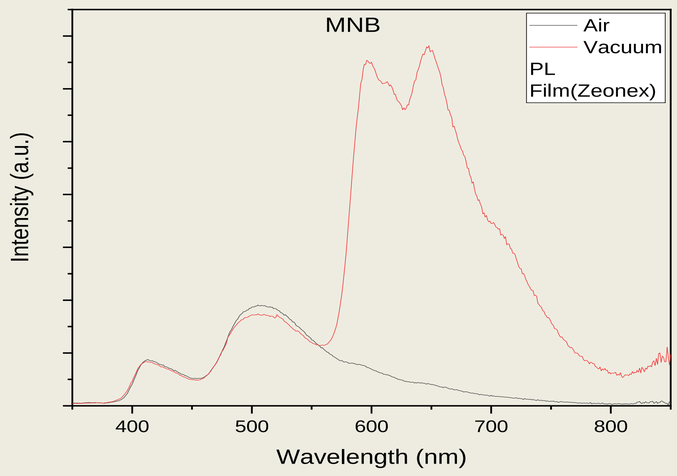
Photophysical properties

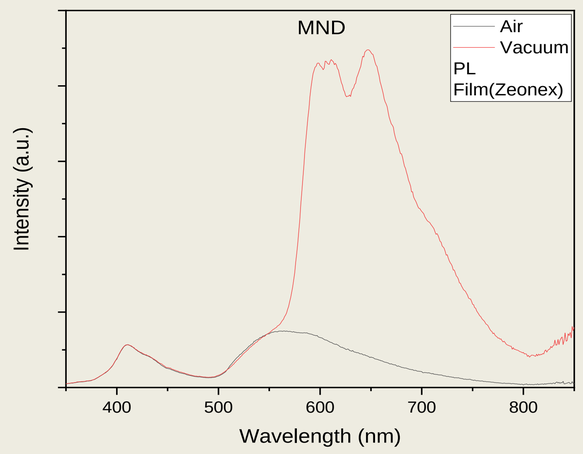
Property	Sample	MNA	MNB	MND	MNE
λ^{PL}, nm	Film	600	650	610	640
	Toluene	450	475	440	420
PLQY, %	Toluene	0.03	0.15	0.03	0.21

RTP property









Conclusions

Four bromine differently substituted naphthalimide derivatives were synthesized. The yields of the target compounds were in the range of 42-78%.. The PL spectra of toluene solutions and films peaked at the wavelengths varying from 420 to 650 nm. The toluene solutions and thin films of all four synthesized compounds showed room-temperature phosphorescence.

References

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3. Kenry, C. Chen, B. Liu // Enhancing the performance of pure organic room-temperature phosphorescent luminophores, Nature Communications, 2019, **10**, 2111-2112.