

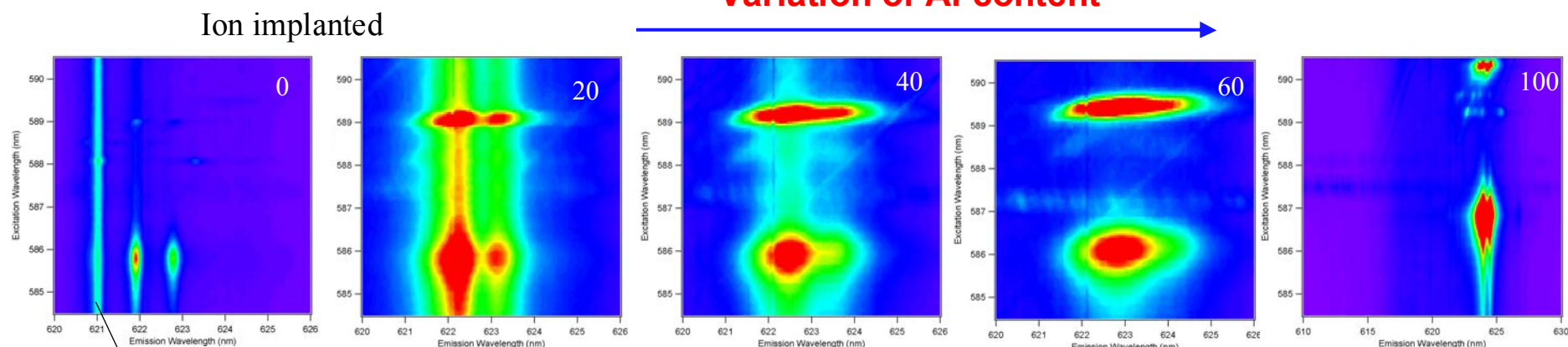
## Combined Excitation Emission Spectroscopy of Eu ions in GaN and AlGaN \*

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### Introduction and Goals:

GaN is one of the most promising semiconductor hosts for RE emitters and lasing. Electroluminescence and laser action in Eu-doped GaN has been reported under optical excitation. For that it becomes important that all rare earth ions are excited effectively. We applied the site-selective technique of combined excitation emission spectroscopy to the Eu:GaN material system with the following goals: *Understand the incorporation of the rare ions into the host materials and how the different incorporation sites participate in different excitation schemes.*

### Variation of Al content

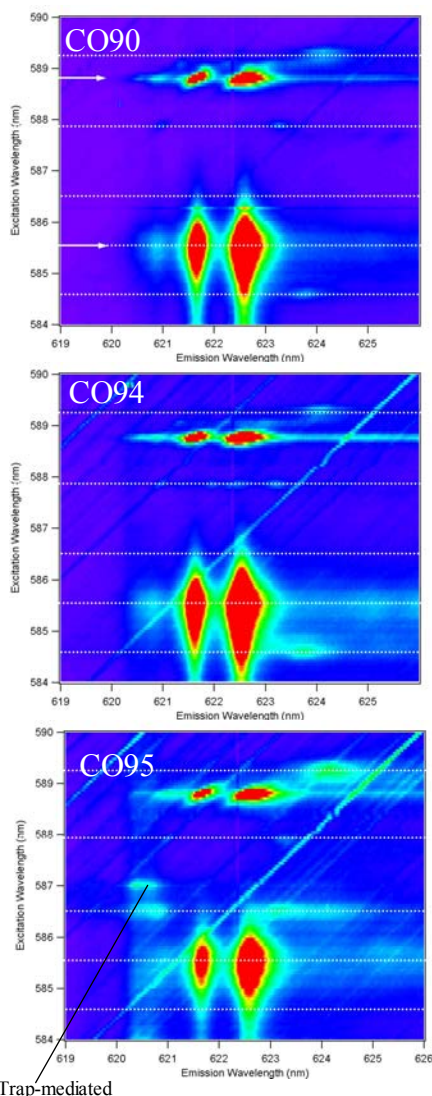


Ion implanted

Trap-mediated

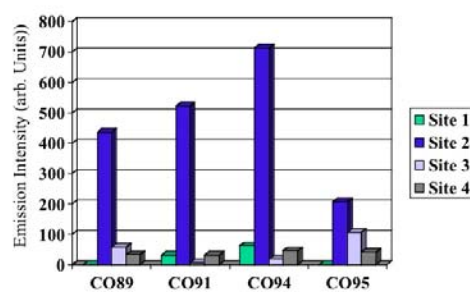
IGE

Variation of preparation conditions



Trap-mediated

GaN:Eu Sample No.	Shutter open/closed time during <i>one cycle</i>			# of cycles repeated
	Group III ON	Group III OFF	Group V open	
C089	60 min	0 min	60 min	1
C095	20 min	5 min	25 min	3
C094	15 min	5 min	20 min	4
C091	10 min	5 min	15 min	6

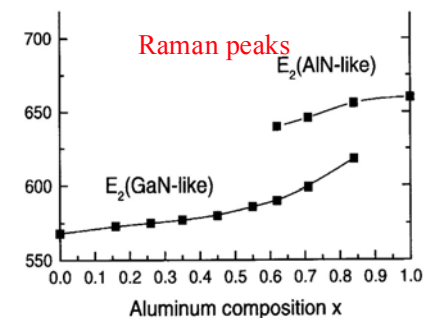
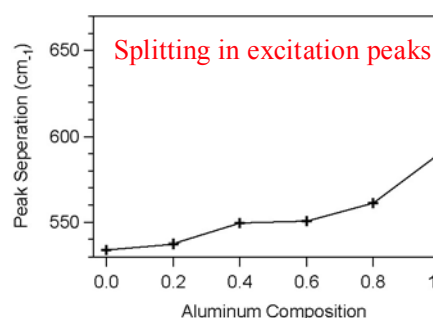
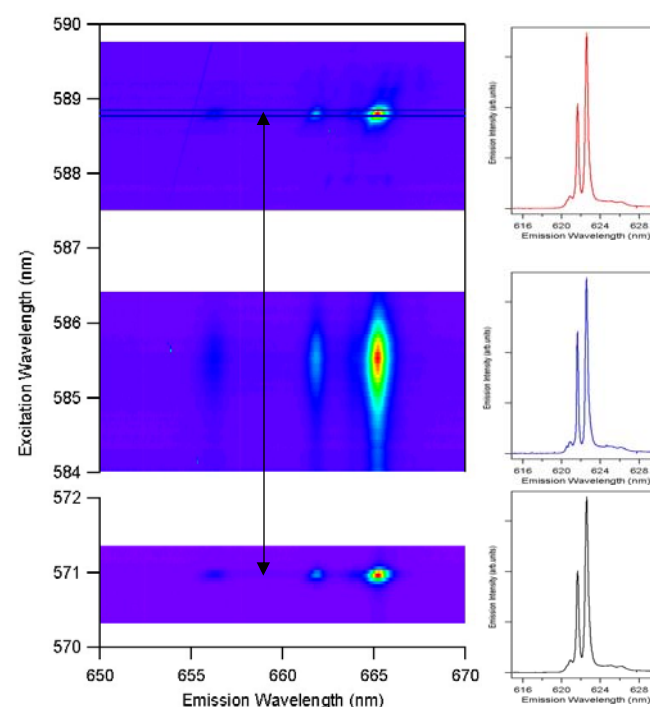


### Conclusions

- Trap related ions can be excited resonantly
- Special trap seems to play a role for most intense EL (CO95)
- In the forbidden excitation transition electron phonon coupling seems to play a role

### Evidence for electron-phonon coupling

A single excitation transition shows multiple excitation peaks that exhibit identical emission spectra



\* Samples have been supplied by the groups of Prof. Steckl (U. Cincinnati) and A. Wakahara (Toyohashi University)