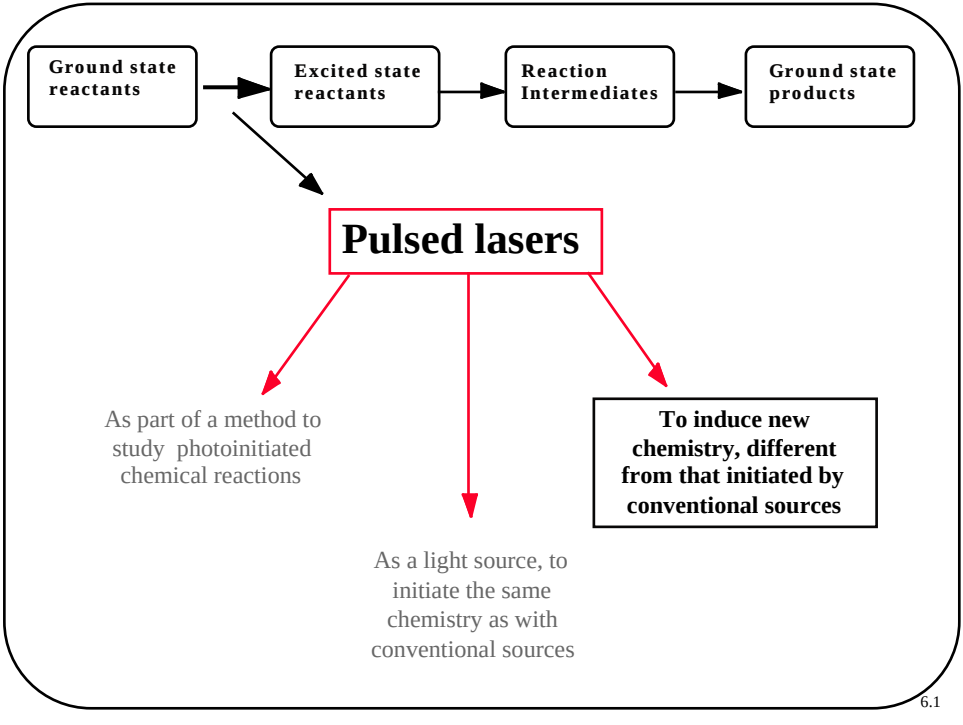
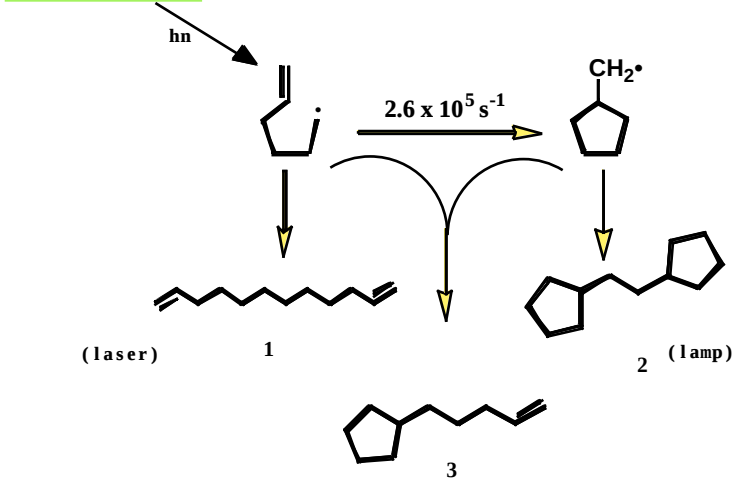
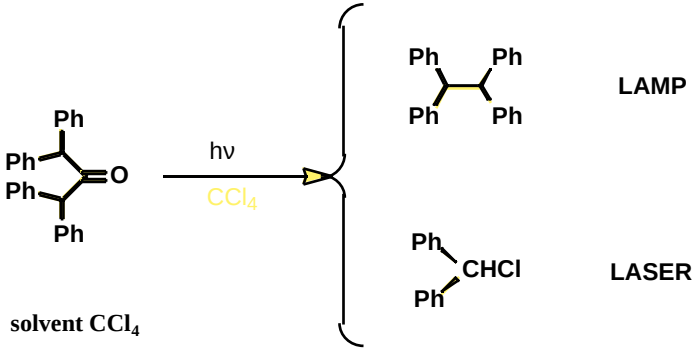

Ground state reactants
Excited state reactants
Reaction Intermediates
Ground state products
Pulsed lasers
As part of a method to study photoinitiated chemical reactions
As a light source, to initiate the same chemistry as with conventional sources
To induce new chemistry, different from that initiated by conventional sources

A laser and a lamp can give different products even if two photon processes do not occur

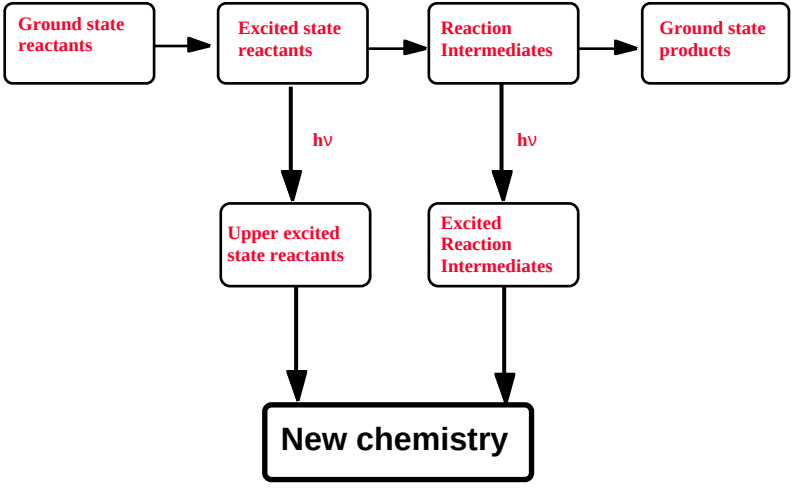
Photochemical source



The photochemistry of tetraphenylacetone gives different products depending on the light source



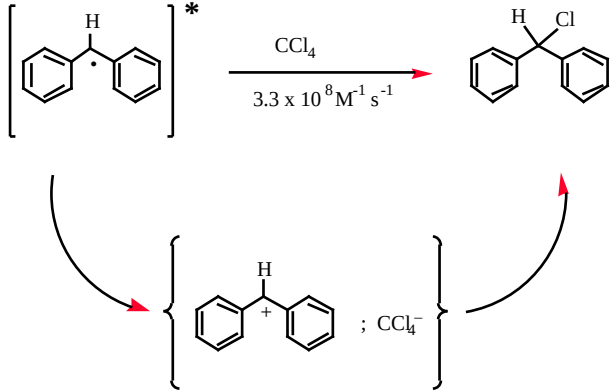
Laser initiated two-photon processes



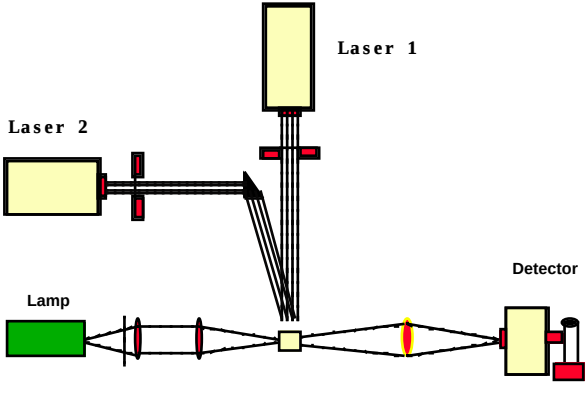
Halogen abstraction reactions of excited

diphenylmethyl radicals are quite common.

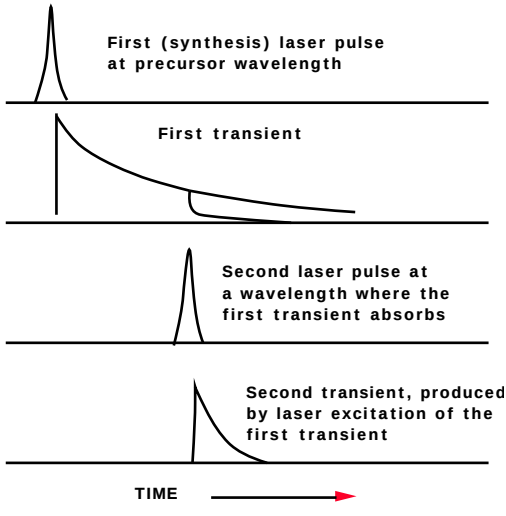
They are known to involve a charge transfer mechanism



Laser Flash Photolysis
Employing two-color two-laser techniques

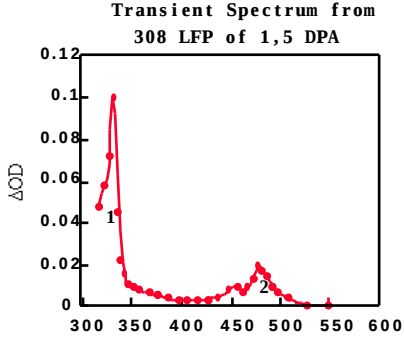


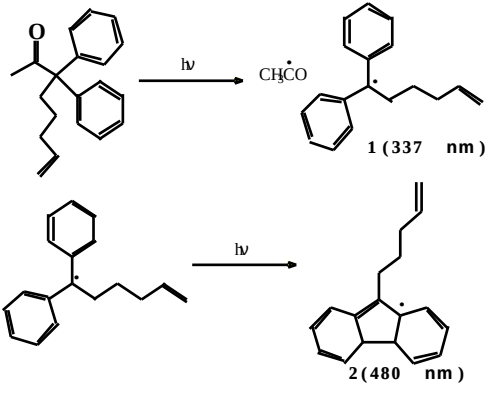
Sequence for two-laser two-color experiments



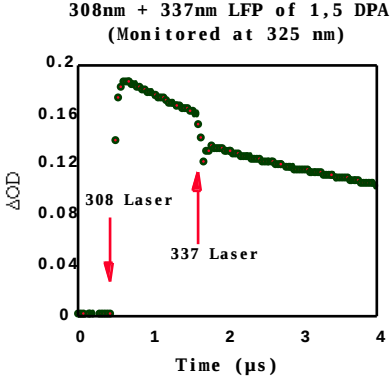
Acc. Chem. Res. 21, 22 (1988)

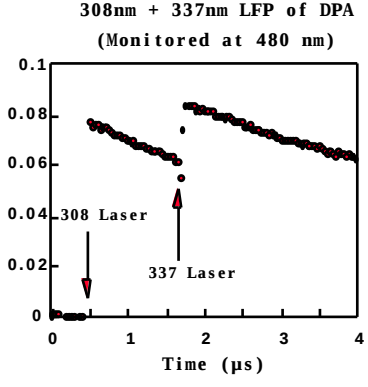
Photolysis of Alkyl Substituted Diphenylmethyl Radicals



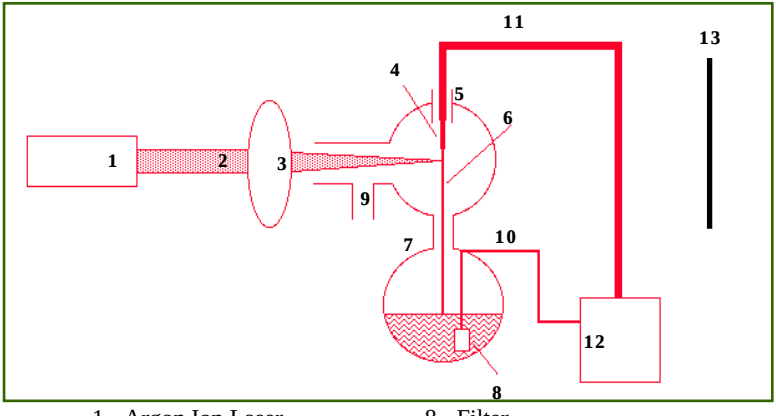


Two-Laser Experiments





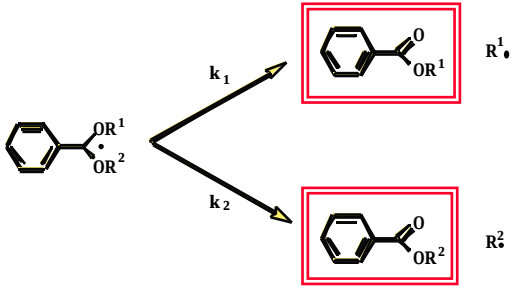
The Laser Beam - Liquid Jet

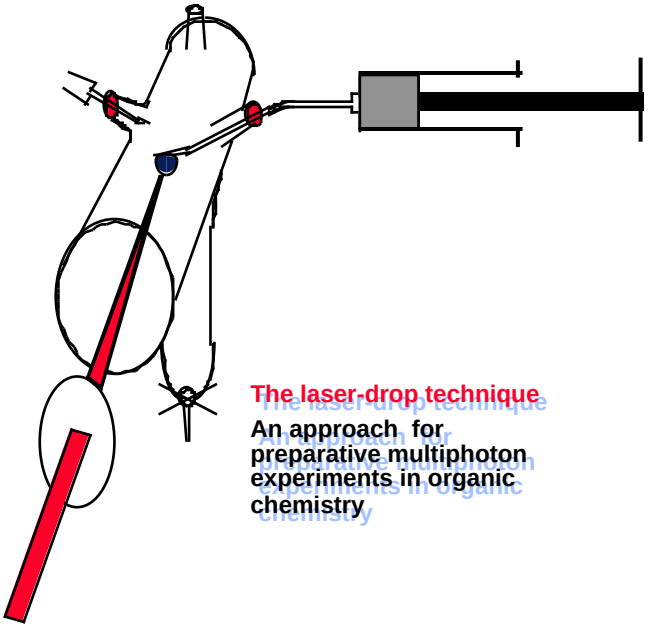


1 - Argon Ion Laser
2 - Laserbeam
3 - Lens on Motor Positioner
4 - Capillary
5 - Glass Bulb
6 - Jet Stream
7 - Collecting Flask
8 - Filter
9 - Inert Gas Supply
10 - Low Pressure Tubing
11 - High Pressure Tubing
12 - HPLC Pump
13 - Projection Screen

k_2 / k_1 for Laser Jet Photolysis of Dialkoxybenzyl Radical Precursors

Radicals		Thermolysis	Lamp Photolysis	Laser Jet Photolysis
R^1	R^2	56°C	35°C	≤40°C
Me	Et	6.5	4.2	0.90
Et	i-Pr	12	6.4	1.25
Me	i-Pr	>40	25	1.10

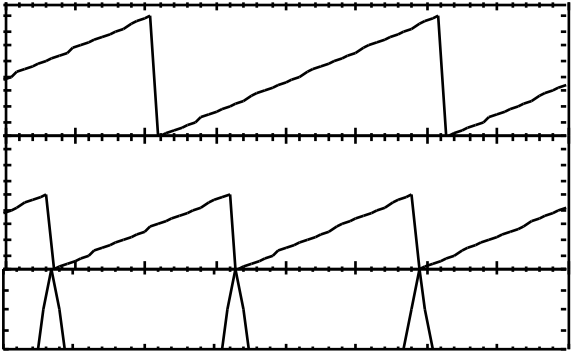




The laser-drop technique

An approach for preparative multiphoton experiments in organic chemistry

Laser drop timing sequence

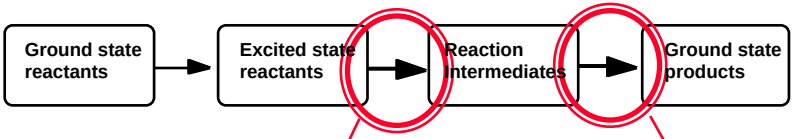


Spontaneous drop formation

Induced drop removal

Excitation laser

Low cost add-ons to a laser photolysis system



AUXILIARY LASER TECHNIQUES

- Near IR emission (for singlet oxygen)
- Photoacoustic spectroscopy
- Transient conductivity
- Mirage spectroscopy
- Thermal Lensing
- Time resolved light scattering

SINGLET OXYGEN EMISSION

$$O_2(^1\Delta_g) \longrightarrow O_2(^3\Sigma_g)$$

1269 nm

1588 nm

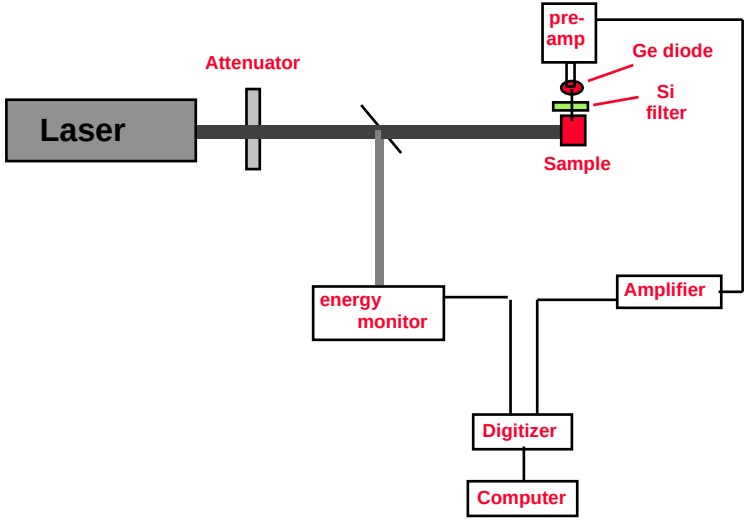
$$O_2(^1\Delta_g) + O_2(^1\Delta_g) \longrightarrow O_2(^3\Sigma_g) + O_2(^3\Sigma_g)$$

"dimol emission"

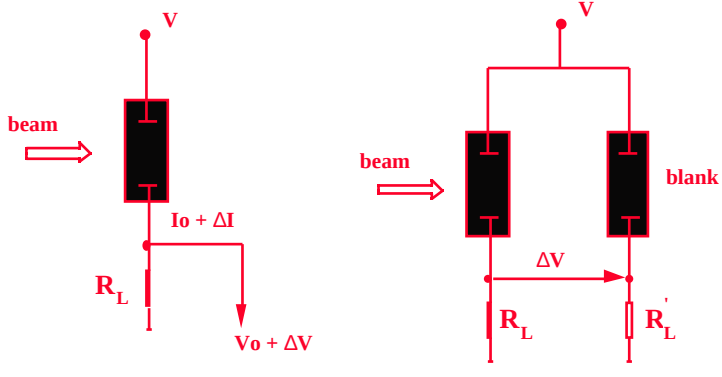
634 nm

703 nm

Singlet oxygen time resolved detection

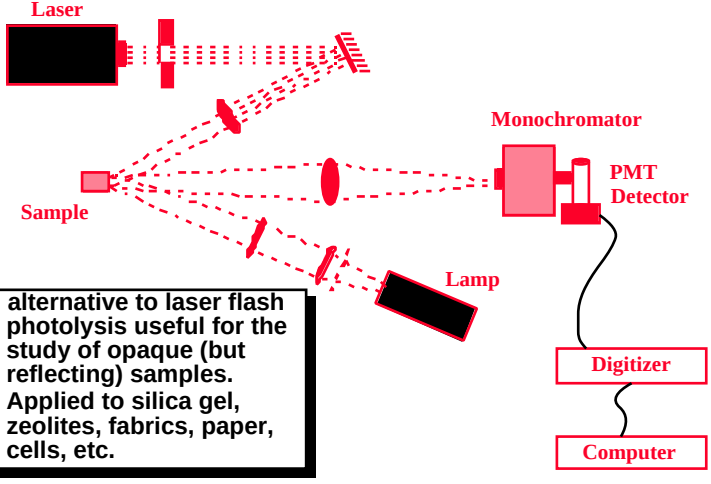


CONDUCTIVITY SET-UPS



Laser-flash photolysis with

time-resolved diffuse reflectance detection



An alternative to laser flash photolysis useful for the study of opaque (but reflecting) samples. Applied to silica gel, zeolites, fabrics, paper, cells, etc.