

# Optical and mid-IR Time-Resolved Spectroscopy as a Tools Complementary to X-ray Spectroscopy and Scattering

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# XFEL Centers of Excellence (Centra Doskonałości XFEL)

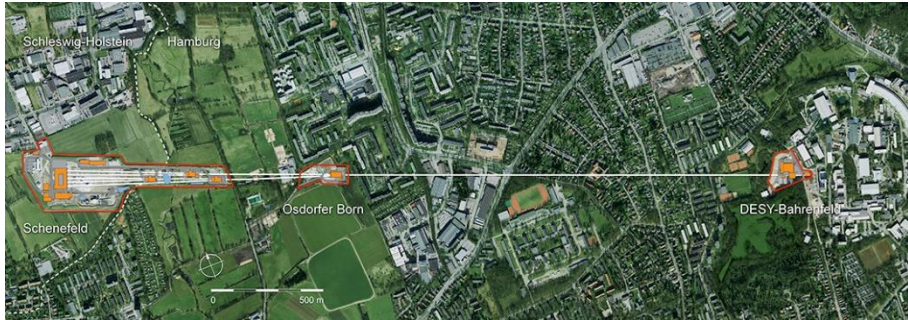


- Support of the polish XFEL Users
- Propagation of knowledge on Eu-XFEL capabilities in the scientific community

- Source of ultra short and ultra intensive X-ray pulses



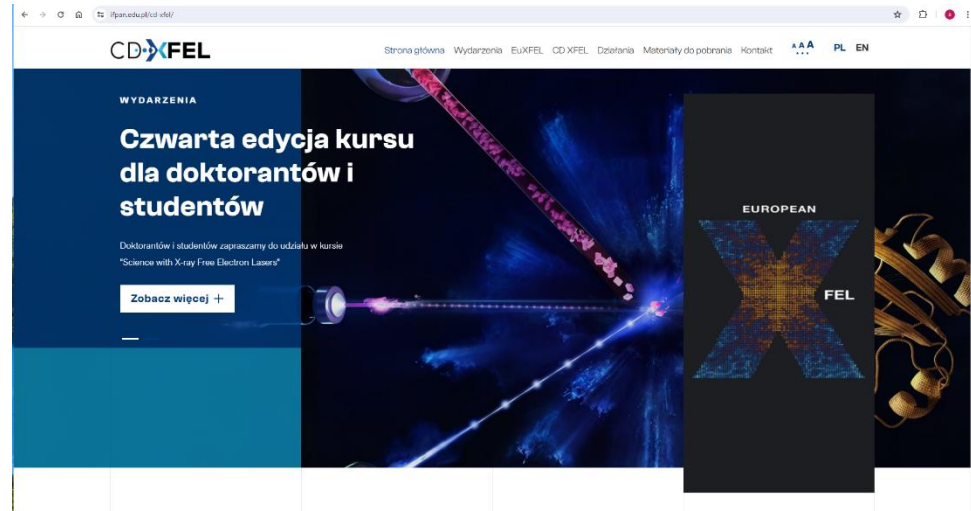
**XFEL**  
HUB-POLAND



# XFEL Centers of Excellence Actions



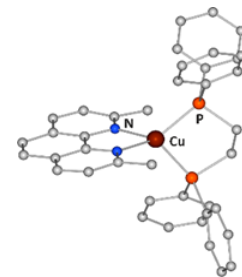
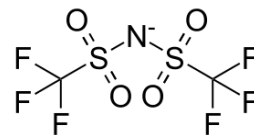
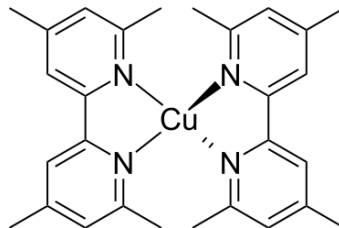
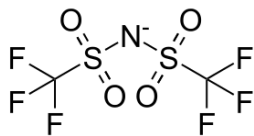
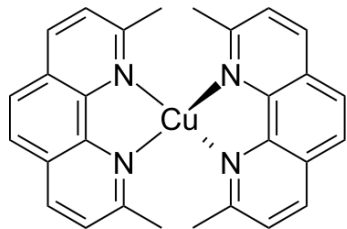
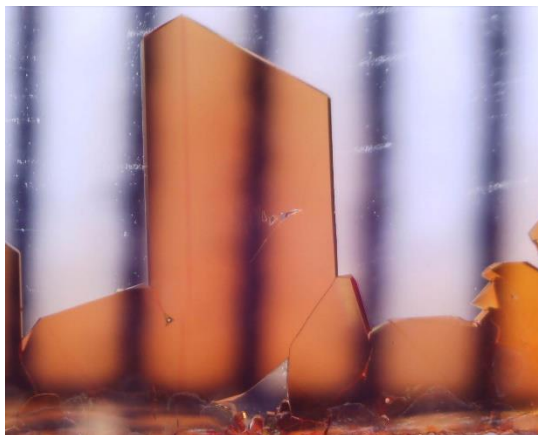
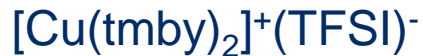
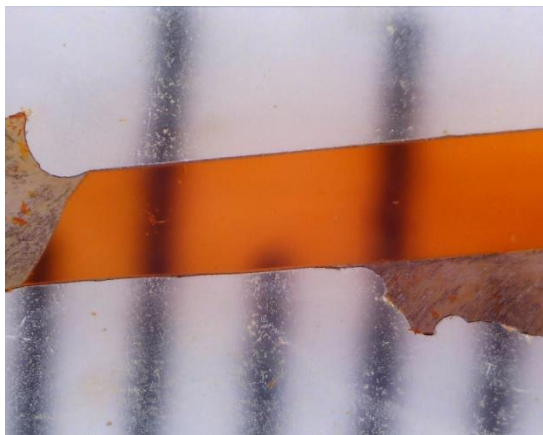
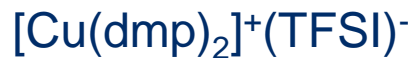
- Funding participation in XFEL related events
- Course for PhD and MSc Students
- Conference sessions and workshops
- Internships for young scientists
- Support in Conducting preliminary research



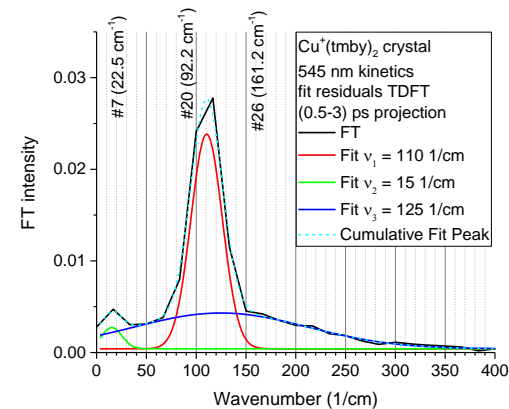
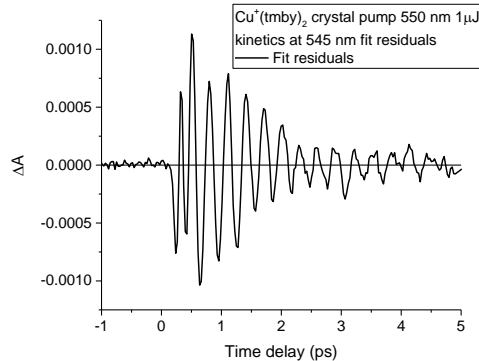
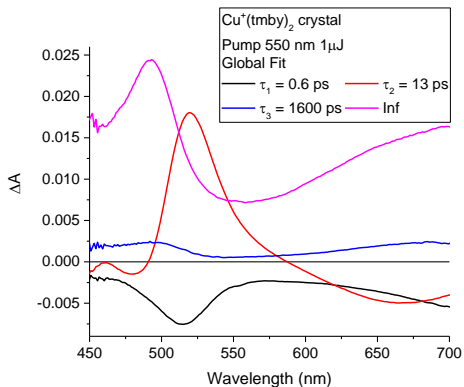
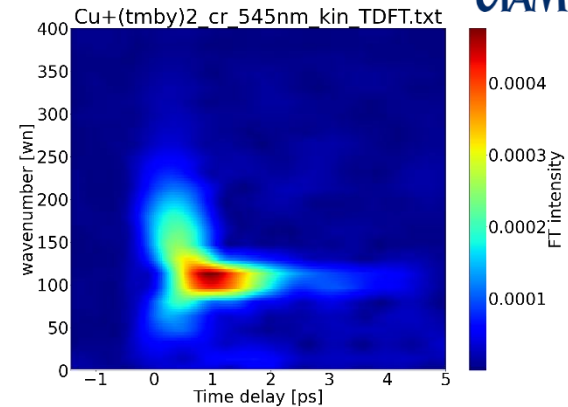
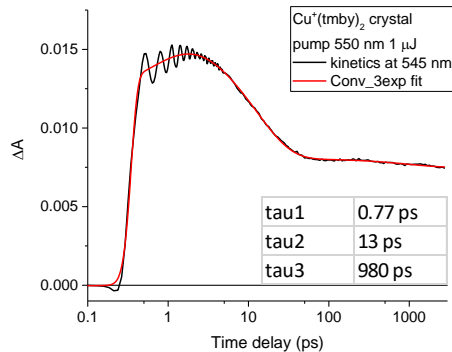
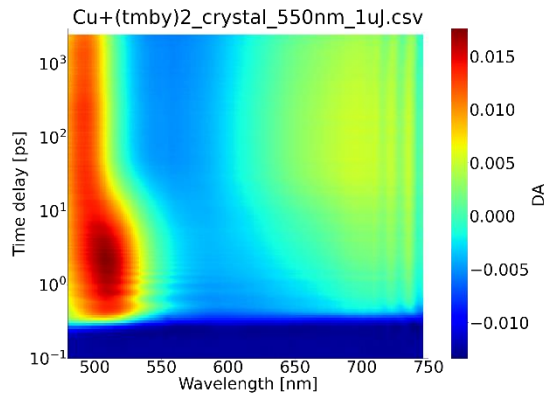
<https://www.ifpan.edu.pl/cd-xfel/>

# Preliminary optical transient absorption study for time resolved photo-crystallography

Glass	
Spacer	Crystal
Glass	

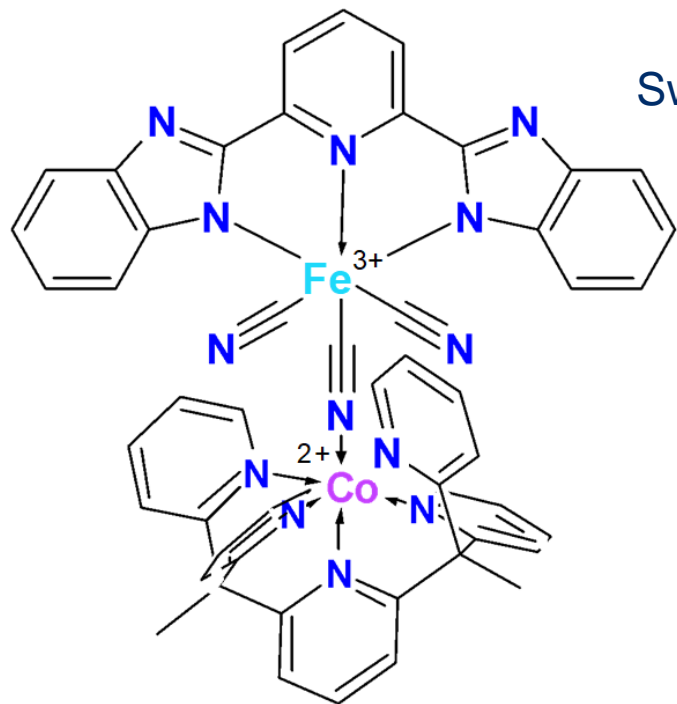


# Transient Absorption (VIS) results for exemplary Cu complex crystal



Pump wavelength  $\lambda = 550$  nm, pump pulse energy  $1 \mu\text{J}$

# Searching for the photoinduced Metal-Metal CT states in Fe-Co diad



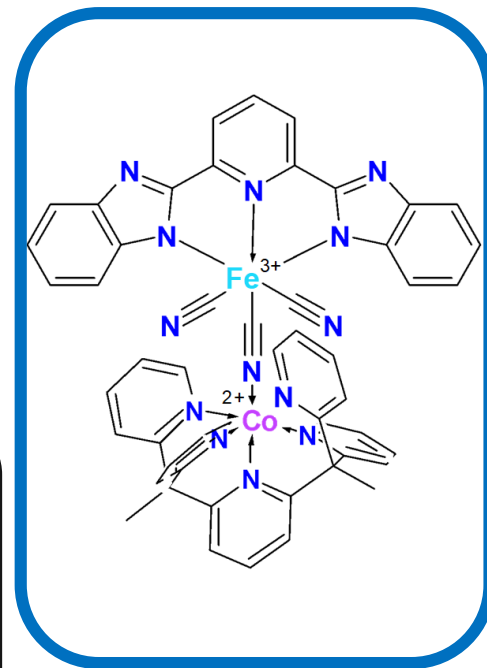
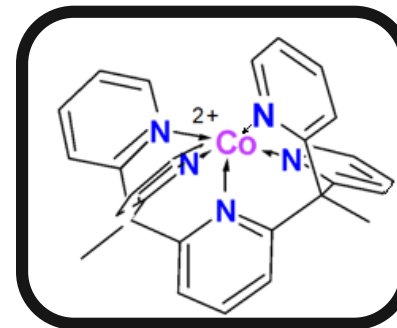
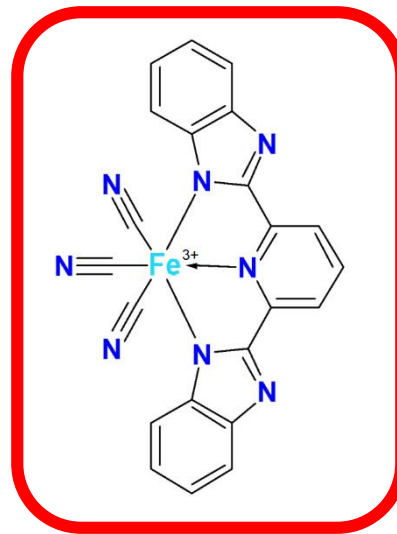
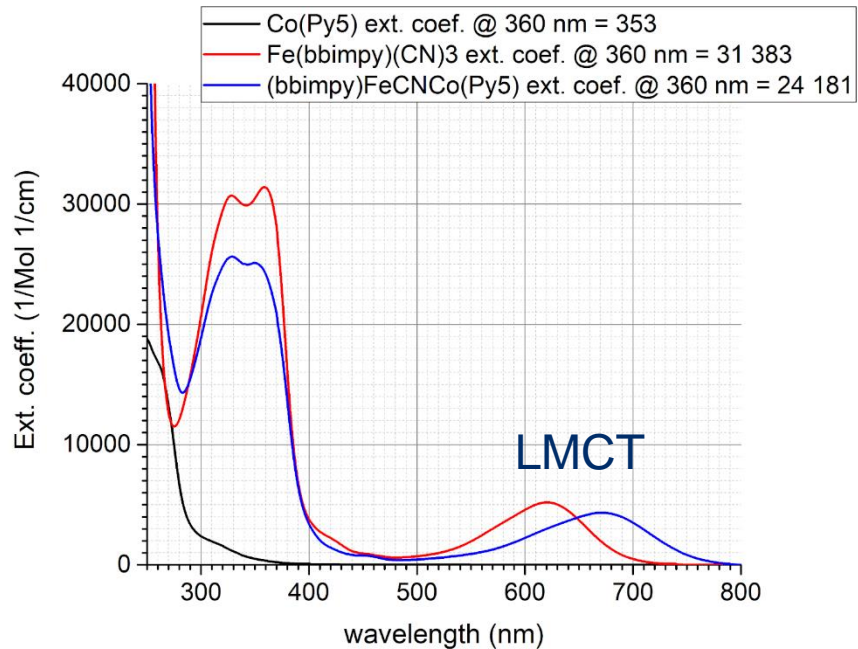
Switching properties:

- $\text{Fe}^{3+}_{\text{LS}} - \text{Co}^{2+}_{\text{HS}} \rightarrow \text{Fe}^{2+}_{\text{LS}} - \text{Co}^{3+}_{\text{LS}}$  upon protonation (RT)
- $\text{Fe}^{3+}_{\text{LS}} - \text{Co}^{2+}_{\text{LS}} (<100\text{K}) \rightarrow \text{Fe}^{3+}_{\text{LS}} - \text{Co}^{2+}_{\text{HS}} (>100\text{K})$

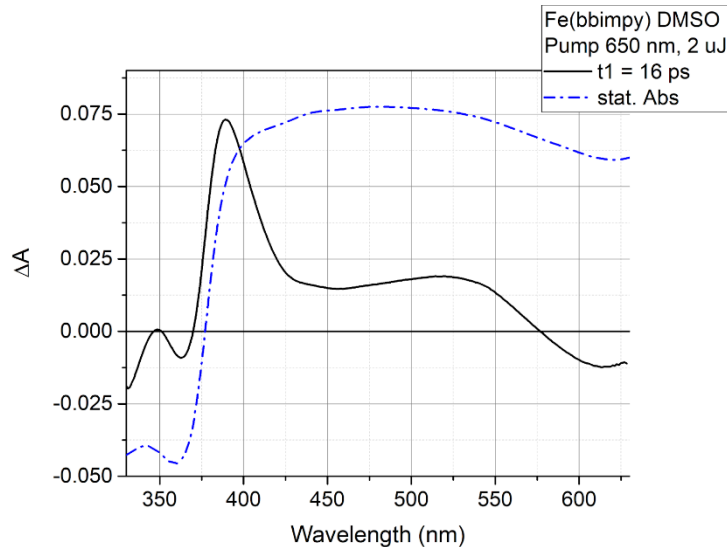
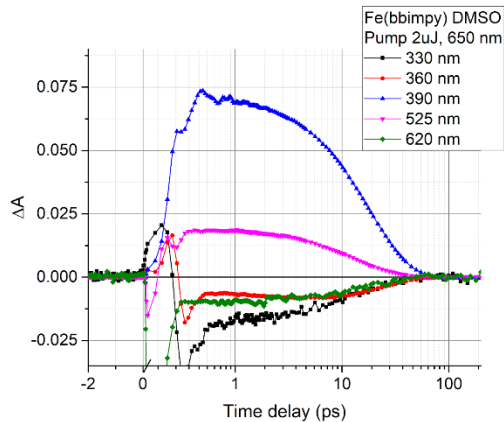
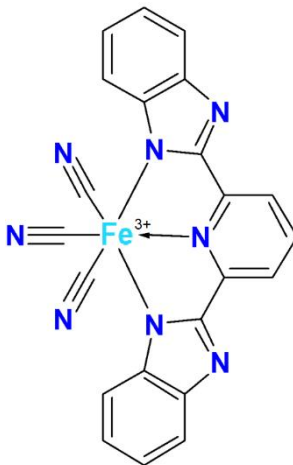
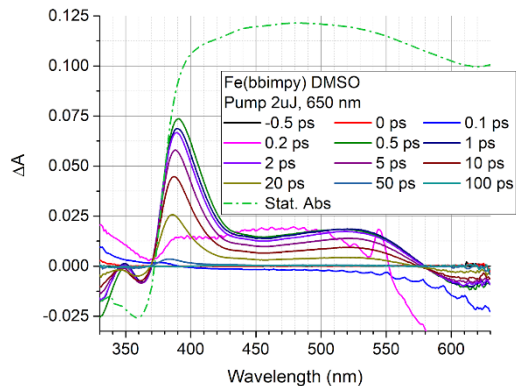
Chem. Sci., 2013, 4, 2463–2470

- $\text{Fe}^{3+} - \text{Co}^{2+} \rightarrow \text{Fe}^{2+} - \text{Co}^{3+}$  photoinduced MMCT ???

# Searching for the photoinduced Metal-Metal CT states in Fe-Co diad



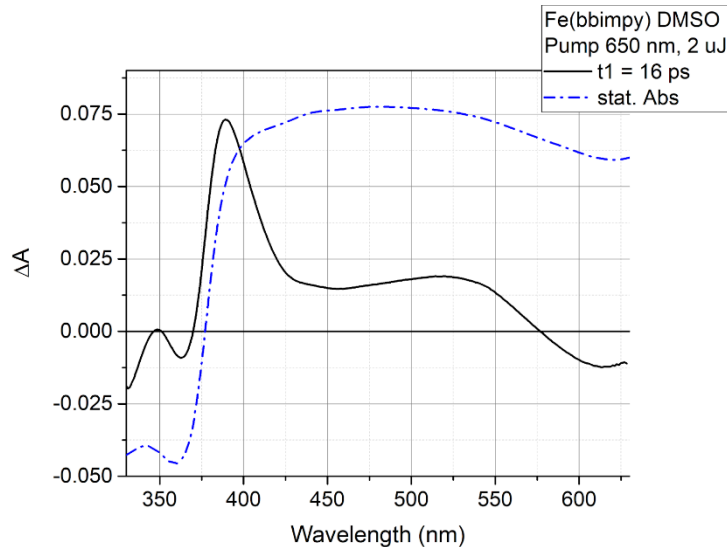
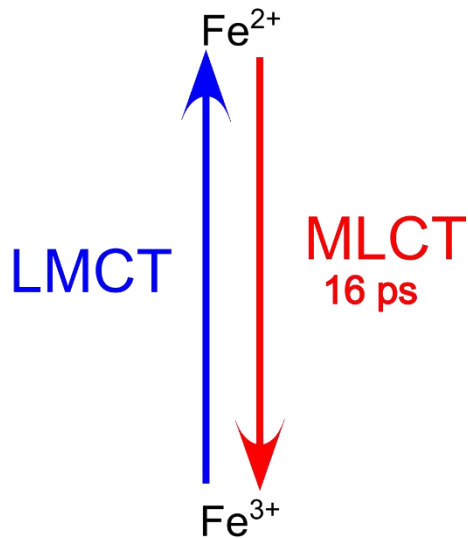
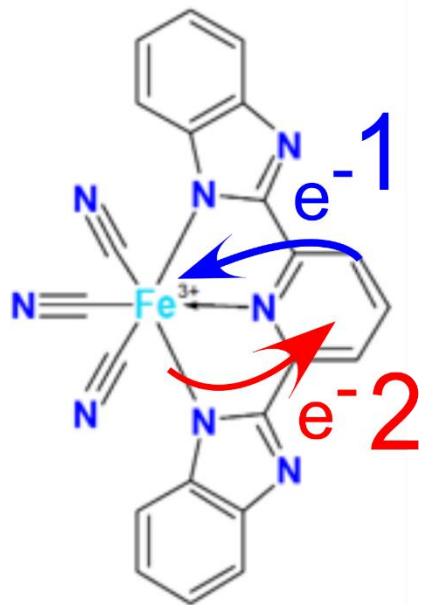
# Transient Absorption (UV-VIS) results for Fe and Fe-Co



Pump wavelength  $\lambda = 650$  nm, pump pulse energy 2 $\mu$ J

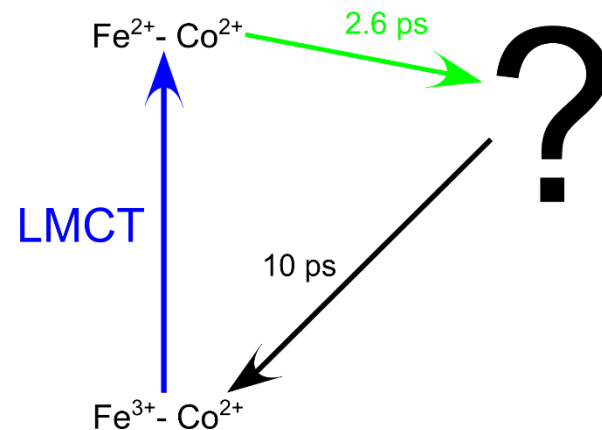
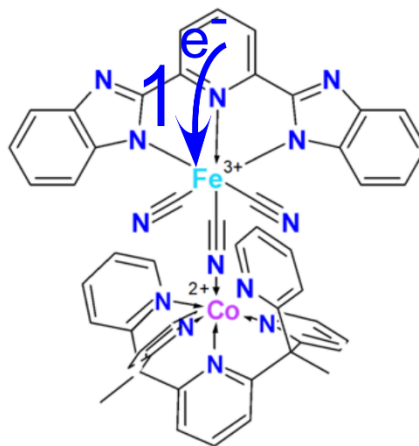
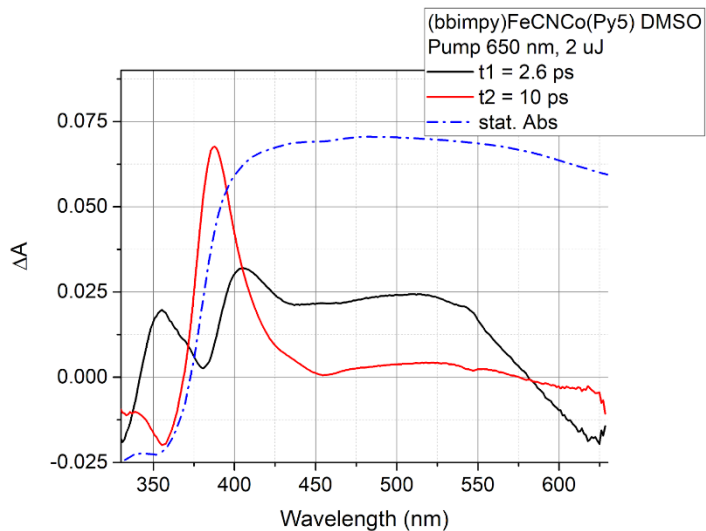


# Transient Absorption (UV-VIS) results for Fe and Fe-Co



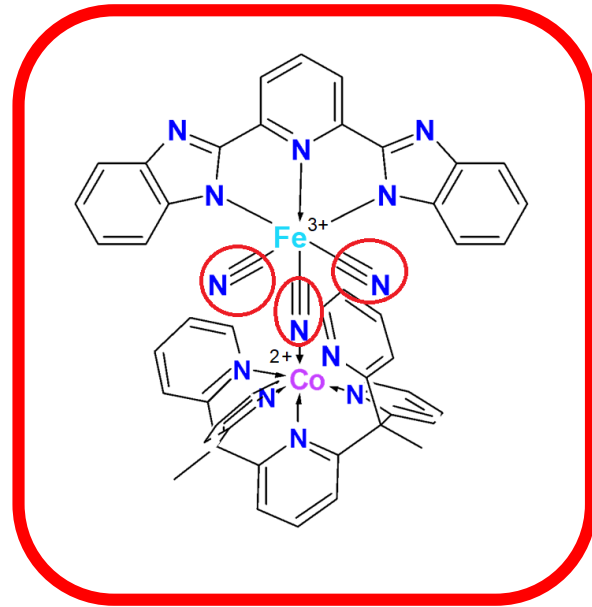
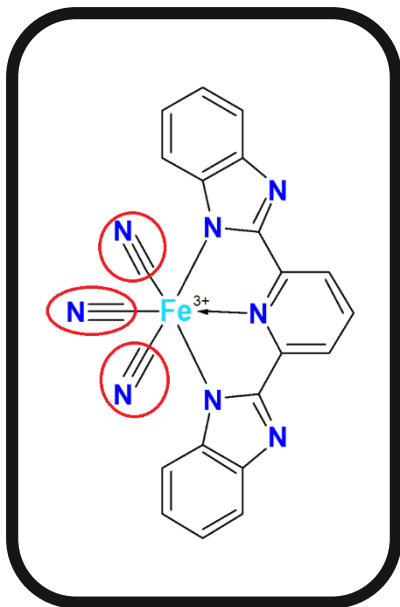
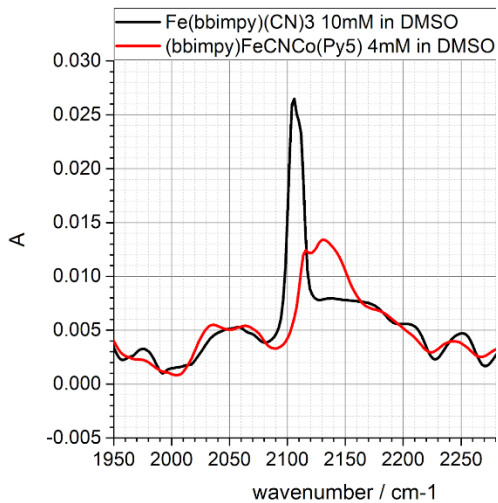
Pump wavelength  $\lambda = 650$  nm, pump pulse energy 2  $\mu$ J

# Transient Absorption (UV-VIS) results for Fe and Fe-Co

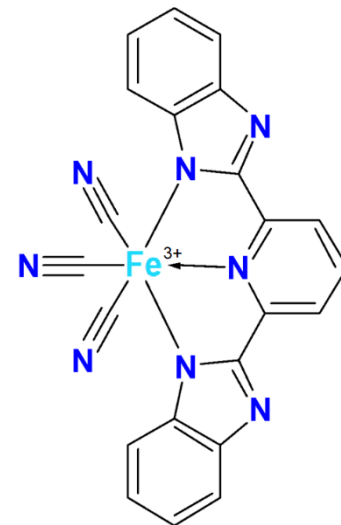
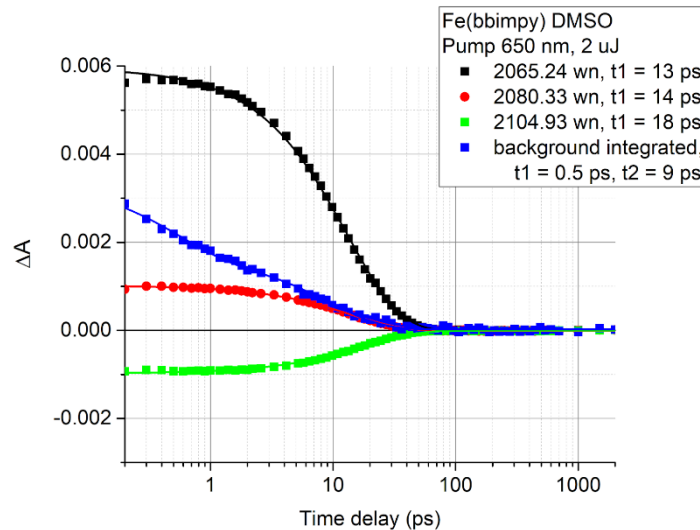
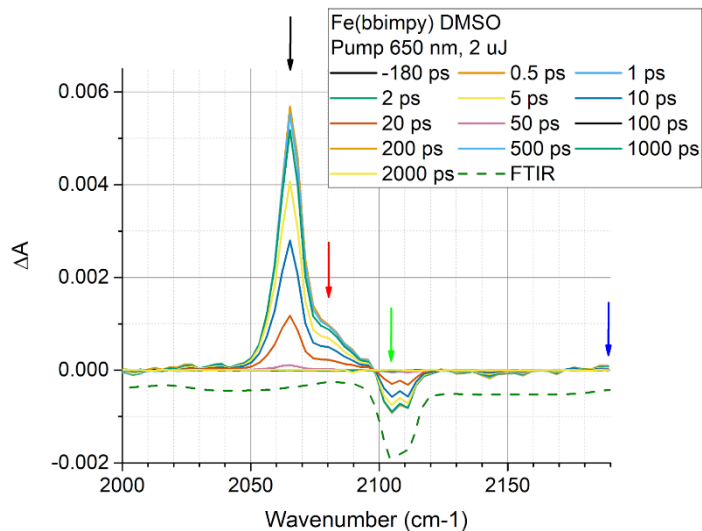


Pump wavelength  $\lambda = 650$  nm, pump pulse energy 2  $\mu$ J

# Searching for the photoinduced Metal-Metal CT states in Fe-Co diad

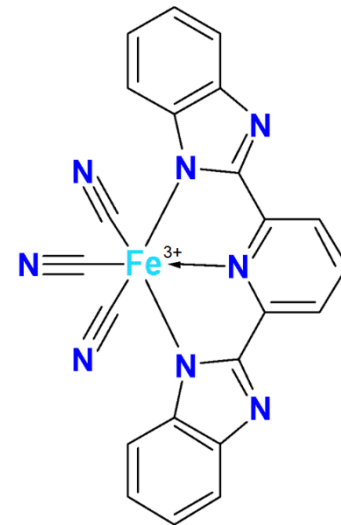
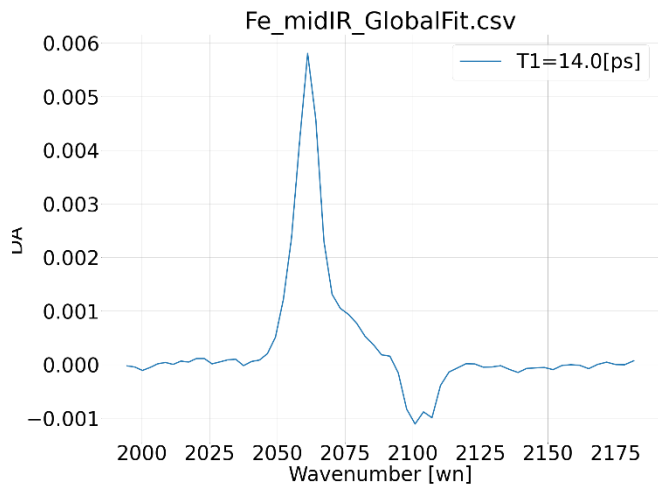
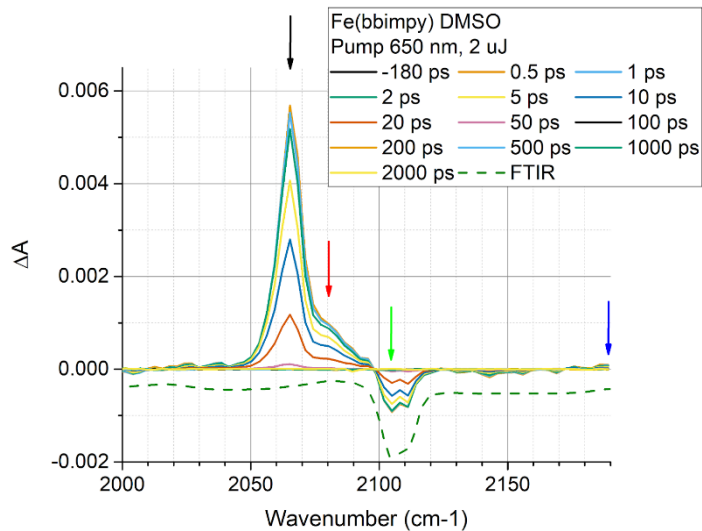


# Transient Absorption (mid-IR) results for Fe complex



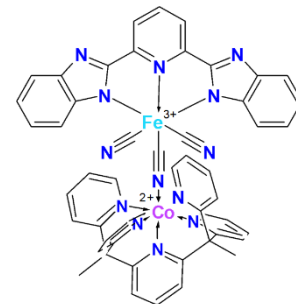
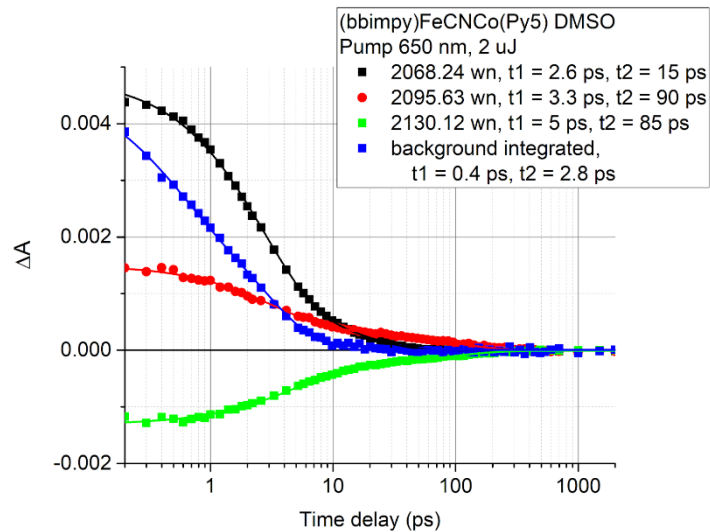
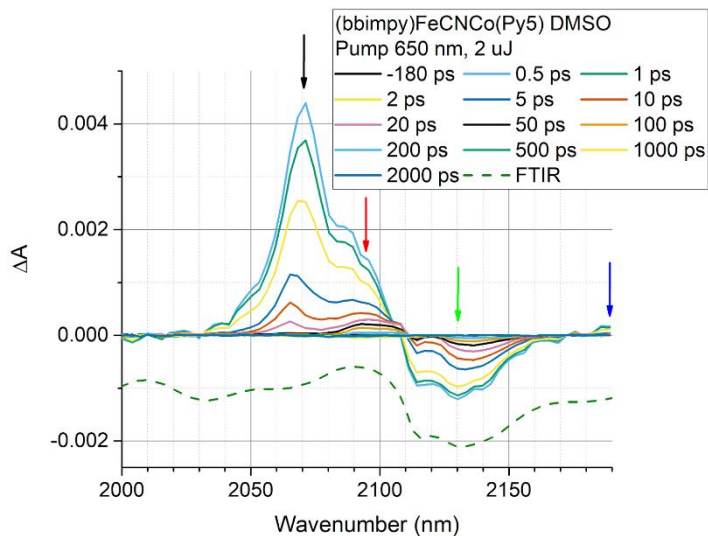
Pump wavelength  $\lambda = 650$  nm, pump pulse energy 2  $\mu$ J

# Transient Absorption (mid-IR) results for Fe complex



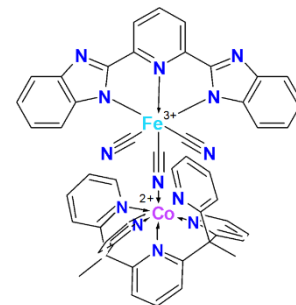
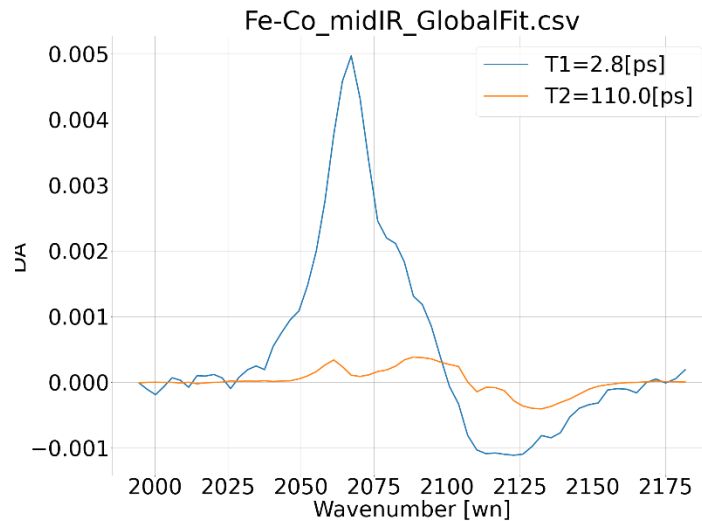
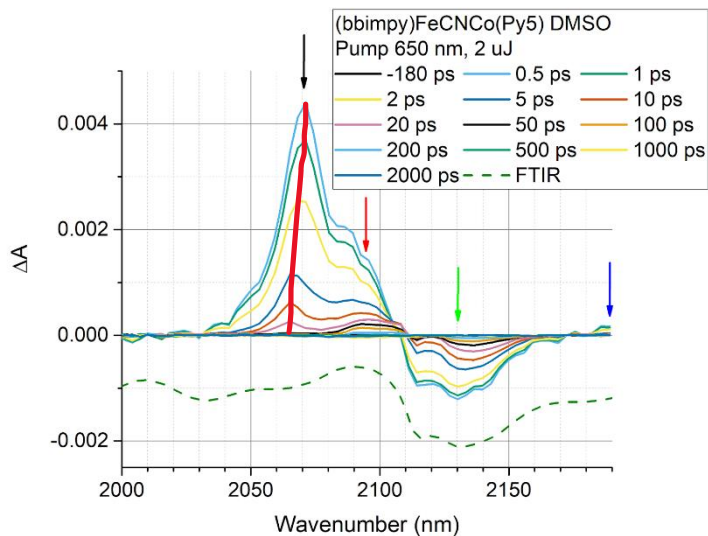
Pump wavelength  $\lambda = 650$  nm, pump pulse energy 2  $\mu$ J

# Transient Absorption (mid-IR) results Fe-Co diad



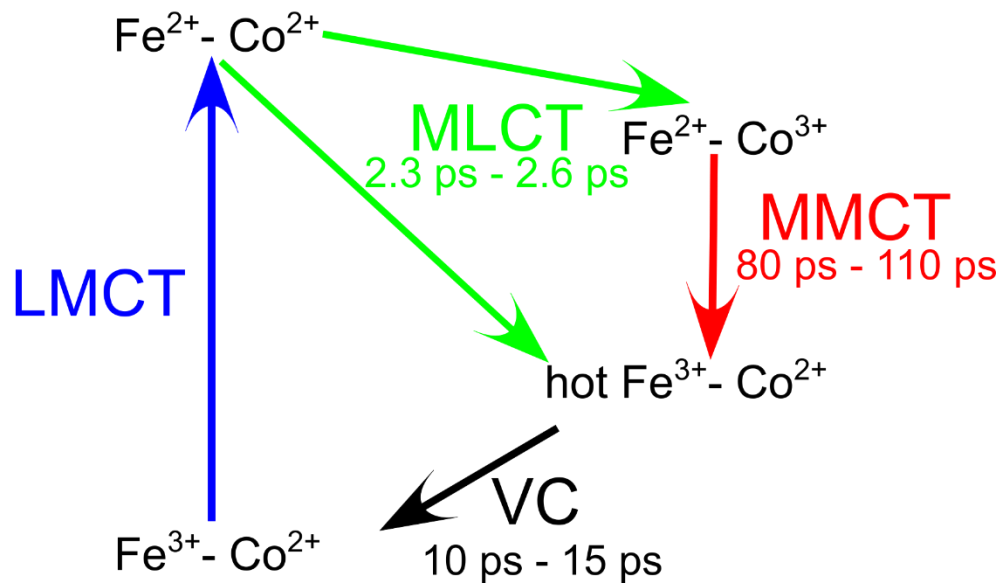
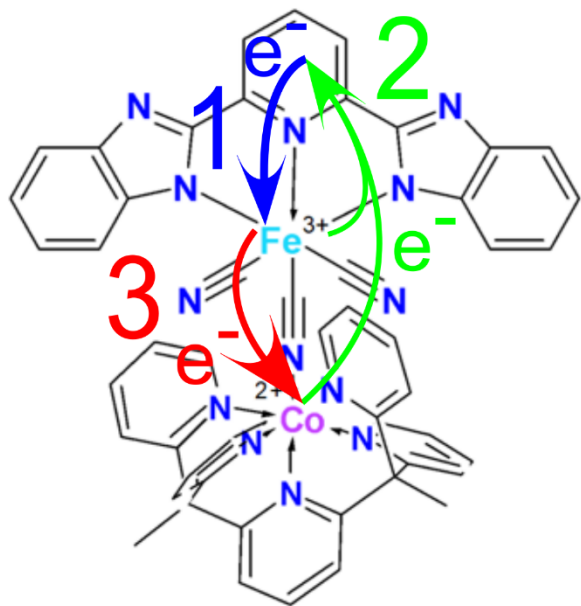
Pump wavelength  $\lambda = 650$  nm, pump pulse energy 2  $\mu$ J

# Transient Absorption (mid-IR) results Fe-Co diad



Pump wavelength  $\lambda = 650$  nm, pump pulse energy  $2\mu$ J

# Searching for the photoinduced Metal-Metal CT states in Fe-Co diad+





## Acknowledgements

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