Investigating nanoplasmonics in diamondoid-metal cluster hybrids

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Abstract

Diamondoids, a class of sp^3 hybridized carbon nanostructures, show size and shape dependent optical properties [1]. They are interesting as light-emitting materials due to their intrinsic UV fluorescence. However, the fluorescence quantum yield of pristine diamondoids is relatively low.

Plasmon resonance effects are known to enhance absorption and emission in noble metal particles in the nanometer size regime strongly [2, 3]. Combinations of diamondoids and sub-nanometer metal clusters are promising candidates to study the fundamentals of such interactions in a size regime where experimental parameters can be controlled by the addition or removal of single atoms. While such effects are widely studied in larger nanoparticles, only few studies have been performed in this size regime before, see for example [4].

We present an experimental set-up for the investigation of nanoplasmonics in size-selected diamondoid-metal cluster hybrids (see figure 1) together with first experimental results on the UV absorption of such systems, acquired using synchrotron radiation. These proof-of-principle experiments, together with recent theoretical work [5], pave the way for further experimental investigations of these and similar systems, in particular of their fluorescence yields, where enhancement or quenching thereof presents an especially interesting direction of inquiry.

References

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Figures

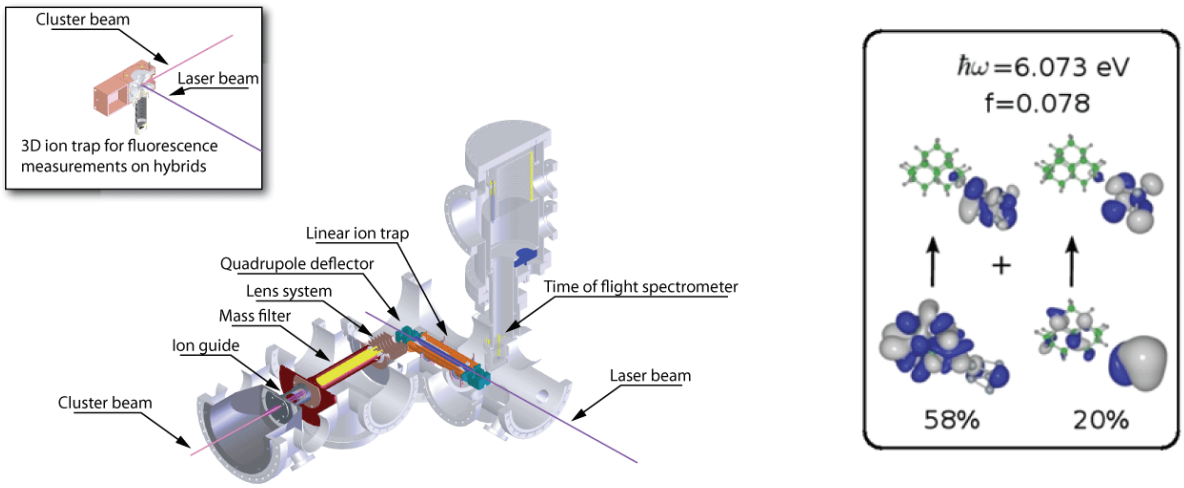

Figure 1: Experimental set-up (center) with fluorescence extension (inset left) and calculated orbitals of a HOMO-LUMO excitation in a triamantanethiol-Ag hybrid.