# Studying nanoplatelets ligands using low-frequency Raman scattering

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Resonant acoustic modes of few monolayers CdSe colloidal nanoplatelets (NPLs) are probed using low frequency Raman scattering and used as a tool to study their surface ligands. As previously described,[1] the low-frequency Raman spectra are dominated by an intense band originating from the thickness breathing mode of these 2D nanostructures. The measured frequencies show strong deviations with respect to the values expected for simple bare plates, arising from the additional mass of the organic ligands that are bound to the free surfaces of the nanoplatelets. The simple model we develop to take into account the mass of the surface ligands is in good agreement with the measured vibration frequencies.[1]

The observation of this effect motivated a systematic study of the influence of ligands weight and functional-group nature on the nanoplatelets vibration frequencies. Depending on the ligand strength, the functional group can be considered to be part of the NPL or not, influencing the damping behavior of the vibration. Furthermore, changing the ligand mass, through modification of the alkane chain length for example (see figure 1) has a dramatic effect on the vibration frequency and can be used as a way to weight the NPLs surface ligands.[2]

Being able to isolate the different ligands effects on the NPLs vibration frequencies will become useful to develop applications using this new way to probe surface ligands. For example, it will be possible to probe ligands exchange dynamics, even with simillar ligands (alkanethiols for example), explore surface segregation effects, or directly observe the binding strength of different functional groups. This new application of low frequency Raman spectroscopy is expected to quickly spread, with the boom of 2D colloidal nanocrystals synthesis and applications.[3]

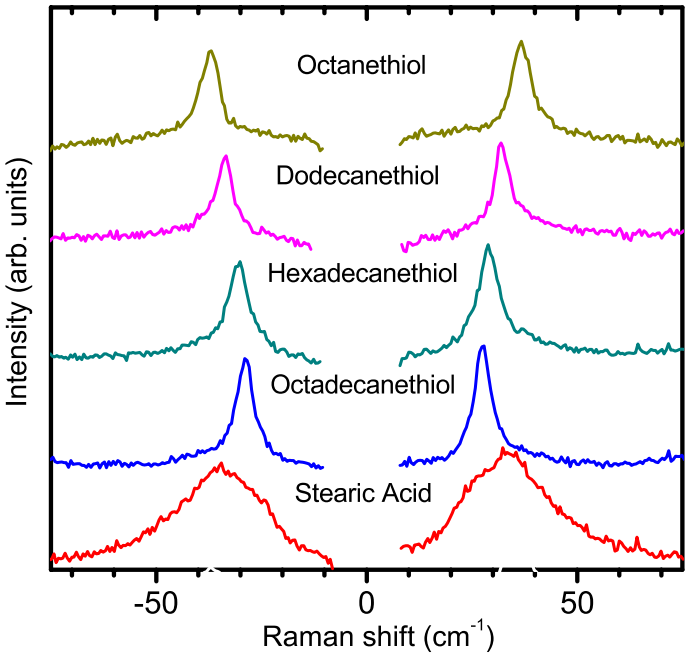


**Fig. 1** Raman spectra of 3-monolayers CdSe NPLs with native carboxylate ligands or exchanged with alkanethiols with different chain length.

1) A.Girard *et al., Nanoscale* **2016**, *8*, 13251–13256.
2) J. Margueritat *et al.,* in preparation.
3) M. Nasilowski *et al., Chemical. Reviews.* **2016**, *116*, 10934–10982.