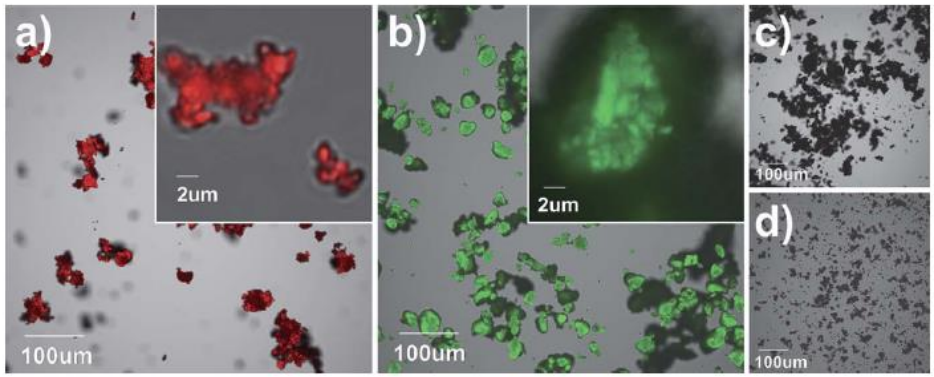
Fluorescent labeling and tracking of nanoclay

Understanding Migration of nano-composites.

Main objective: Track their movement and position. *Modeling transport process*

Confocal microscopy-aided spectrophotometric analysis was used to characterize the emission spectra of the labeled samples. Cofocal Laser Scanning Microscopy images of the rhodamine- and fluorescein-labeled nanoclays and unlabeled counterparts show a clear distinction between the labeled and unlabeled nanoclays

Sample preparation: Labeled and unlabeled nanocomposite films were prepared: the labeled nanocomposite films included 15 wt% of either fluoresceinor rhodamine-labeled o-MMT based on the total amount of clay (3 wt%).



In summary, a new method for the fluorescent labeling of nanoclays was developed that covalently attached fluorescein-5- maleimide (flouorescein) or tetramethylrhodamine-5 maleimide (rhodamine) to silane-treated o MMT. The tagging was confirmed via CLSM.

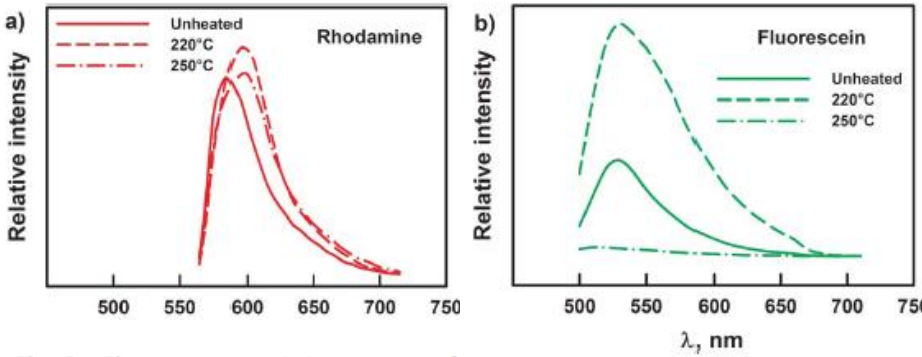
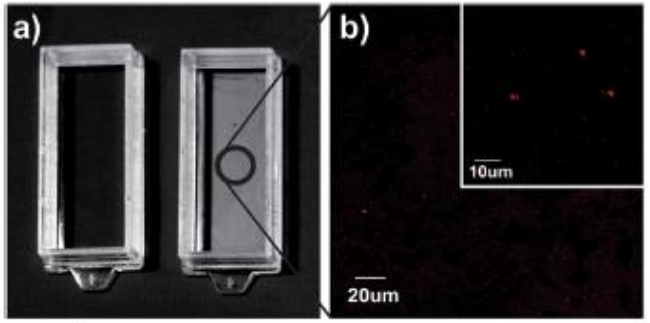


Fig. 3 Fluorescence emission spectra of (a) rhodamine-labeled and (b) fluorescein-labeled nanoclay before and after exposure to 220 and 250 °C for 15 min. The excitation wavelengths were 543 nm (a) and 488 nm (b). Nanoclay samples were heated in a TGA furnace from room temperature and isothermally maintained at the set temperature for 15 min. Changes in emission spectra were quantified using the relative integral fluorescence emission (RIFE) parameter. For rhodamine: $RIFE_{no\ heat} = 1.00 \pm 0.14^{A}$, $RIFE_{220°C} = 1.31 \pm 0.35^{A}$, $RIFE_{250°C} = 1.35 \pm 0.17^{A}$. For fluorescein: $RIFE_{no\ heat} = 1.00 \pm 0.08^{A}$, $RIFE_{220°C} = 3.60 \pm 0.58^{B}$, $RIFE_{250°C} = 0.34 \pm 0.10^{C}$. The mean values with different uppercase superscripts are significantly different ($p < 0.05$) according to Tukey's HSD test.



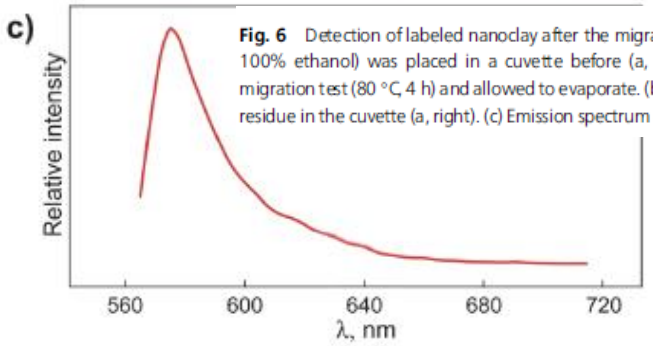


Fig. 6 Detection of labeled nanoclay after the migration test. (a) The solvent (*i.e.*, 100% ethanol) was placed in a cuvette before (a, left) and after (a, right) the migration test (80 °C, 4 h) and allowed to evaporate. (b) Confocal micrograph of the residue in the cuvette (a, right). (c) Emission spectrum of the bright particles in (b).

Reference: Carlos A. Diaz, et al, *Flourescent labeling and tracking of nanoclay*, Nanoscale, 2012.