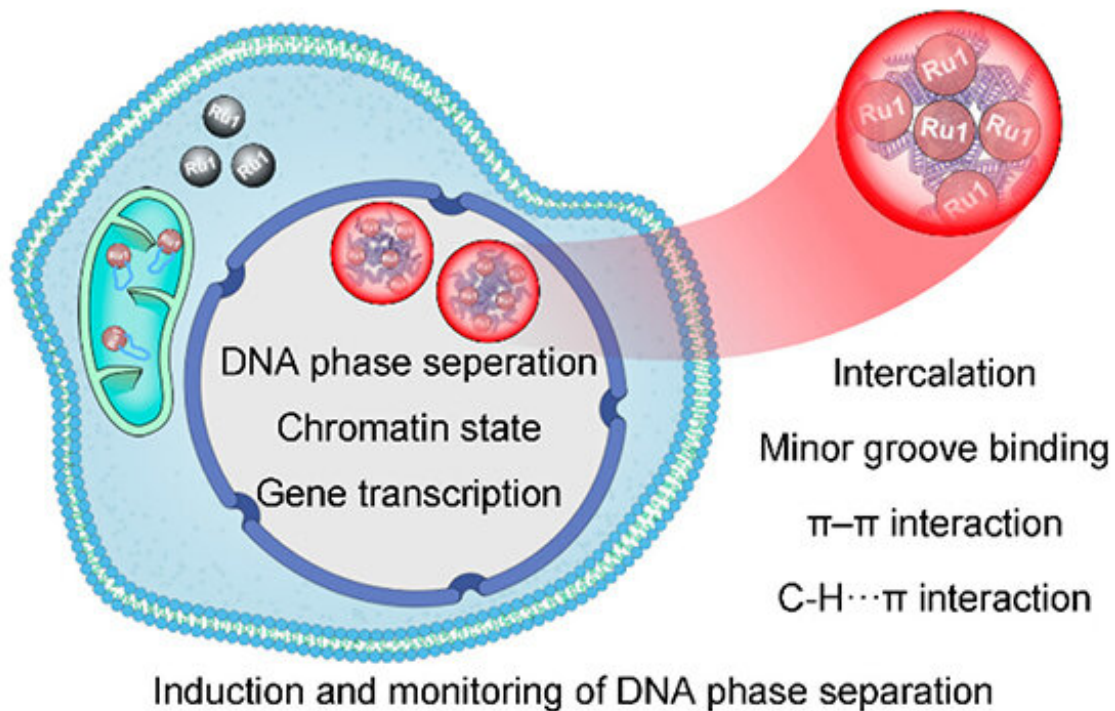


Molecular mechanism of ruthenium-complex-induced DNA phase separation revealed

July 30 2021, by Li Yuan



The mechanisms of DNA phase separation induced by ruthenium complex.
Credit: ZHANG Yuebin and LI Guohui

The phenomenon of "liquid-liquid" phase separation (LLPS) of biological macromolecules in living cells regulates many cell activities.

DNA LLPS manipulates many important processes such as [gene](#)

[transcription](#), translation, and chromosome high-level structure assembly. Abnormality of DNA LLPS causes oncogene expression, genome inactivation, uncontrolled transcription activation and other [cellular processes](#), which are directly related to fatal diseases.

Recently, a research group led by Prof. Li Guohui from the Dalian Institute of Chemical Physics (DICP) of the Chinese Academy of Sciences (CAS), in collaboration with Prof. Mao Zongwan's group from Sun Yat-Sen University, revealed the molecular mechanism of ruthenium complex induced DNA phase separation in living [cells](#).

This study was published in *Journal of the American Chemical Society* on July 22.

Prof. Mao's group proposed a metal ruthenium complex with high DNA affinity and photo-switching properties to fulfill the real-time detecting and monitoring of DNA phase separation process in living cells. In addition, the metal ruthenium complexes also exhibited potent anticancer activity both in Vitro and in Vivo conditions.

Prof Li's group utilized multi-scale [molecular dynamics simulations](#) to unveil the underlying mechanism of ruthenium complex induced DNA phase separation, where the positively charged lipophilic triphenylphosphine substituents and the flexible long alkyl chains of the ruthenium complex provided significant contributions in inducing DNA assembly.

This study provides new ideas for the design of interventional reagents for inducing DNA phase separation of living cells.

More information: Wen-Jin Wang et al, Induction and Monitoring of DNA Phase Separation in Living Cells by a Light-Switching Ruthenium Complex, *Journal of the American Chemical Society* (2021). [DOI:](#)

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