DESCRIPTION

Title of the Invention:

~~RUTHENIUM COMPLEX MIXTURE, METHOD OF PRODUCING THE SAME, COMPOSITION FOR FILM FORMATION, RUTHENIUM-CONTAINING FILM, AND METHOD OF PRODUCING THE SAME~~

Technical Field

[0001]

The present invention relates to a mixture of organometallic compounds which is useful, for example, in producing semiconductor elements, and to a method of producing the mixture, a composition for film formation, a metal-containing thin film, and a method of producing the film.

Background Art

[0002]

With the high integration of semiconductor memory elements, the miniaturization of memory cells is proceeding. Use of noble metals such as ruthenium, iridium, and platinum as electrode materials for such memory elements is being investigated. For use in DRAM elements among the memory elements, ruthenium is considered to be a promising electrode material because oxides thereof also have electrical conductivity and ruthenium has excellent suitability for microfabrication. An optimal process for producing a ruthenium-containing thin film in a highly integrated memory element is chemical vapor deposition (hereinafter referred to as CVD) because this method attains excellent step coverage. Organometallic compounds, which are easy to handle among metal compounds, are thought to be suitable for use as raw-material substances for forming thin films using the CVD or atomic layer deposition (hereinafter referred to as ALD). At present, an excellent organometallic compound for forming a thin ruthenium film or thin ruthenium oxide film is (2,4-dimethylpentadienyl)(ethylcyclopentadienyl)ruthenium (hereinafter referred to as DER) because this compound is liquid at ordinary temperature and has excellent handleability and renders stable feeding possible from the standpoints of stability and vapor pressure (patent document 1).

[0003]

It is generally known that thin-film formation at a low temperature is advantageous to the formation of a thin ruthenium film of good quality by CVD, and there is a desire for a ruthenium compound that has high reactivity at lower

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