RESEARCH FRONTIERS

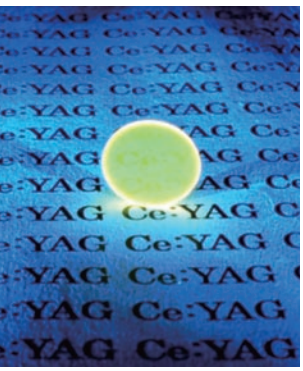
Cutting-Edge Research in Kyoto University

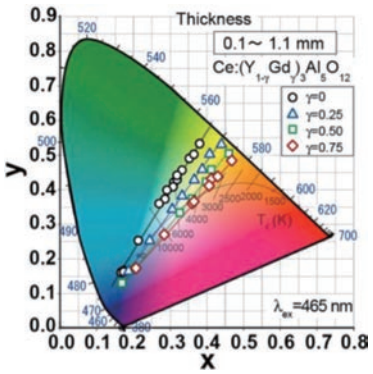
Kyoto University is known for the quality and diversity of its research. Each issue of Research Activities can only highlight a small selection of those endeavors, but we hope to convey an impression of the university's rich academic milieu.

MAT-SCI

Luminescent Ceramics Benefit a New LED Lamp!

Plate-shaped phosphors enable high-power and efficient solid-state lighting.





The Light Emitting Diode (LED) lamp is now widely replacing conventional incandescent lamps and fluorescent tubes, because it efficiently converts input electric-power into white light with no ultraviolet nor infrared light. Also LEDs are free from mercury and thus regarded as an environmental-friendly lighting device. In the LED lamp a blue LED is usually a key device combined with some powder phosphors doped with rare-earth ions, which absorb blue light and emit visible light with lower-energy. We have developed ceramic-plate phosphors with transparency for this combination to produce a white spectrum for illumination. Compared with the powder-form, the ceramic plate has better thermal conductivity and high luminous efficiency. The paper of these results published in 2011 has been top-ranked both in the most-cited and most-downloaded articles among all the papers in Optical Materials journal since September 2013 to present.

Setsuhisa Tanabe, PhD

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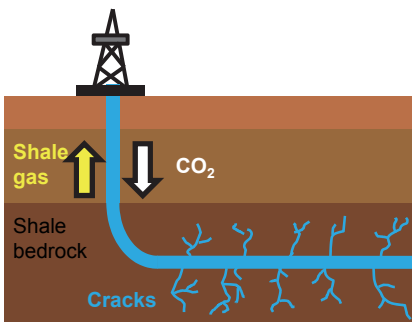
RESOURCE-ENG

New Method to Extract Shale Gas

Fracturing with carbon dioxide instead of water.



We have proposed a new method to extract shale gas (flammable methane gas) trapped in shale bedrock around 3,000 meters deep. Conventional methods to extract shale gas involve making cracks by injecting water into hard shale bedrock. In the new method, carbon dioxide (CO_2) is used instead of water. At great depths where shale gas is extracted, CO_2 becomes very slick, being in a so-called supercritical state. Since we found in our laboratory experiments that supercritical CO_2 can make finer cracks extending in a larger area, we expect CO_2 to produce more shale gas than water. In arid regions such as deserts, this method offers greater advantages. Working in collaboration with Japan Oil, Gas and Metals National Corporation (JOGMEC), we aim to use this method in an actual shale gas field.

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geo.kumst.kyoto-u.ac.jp/lab/member/Ishida_t/English.htm