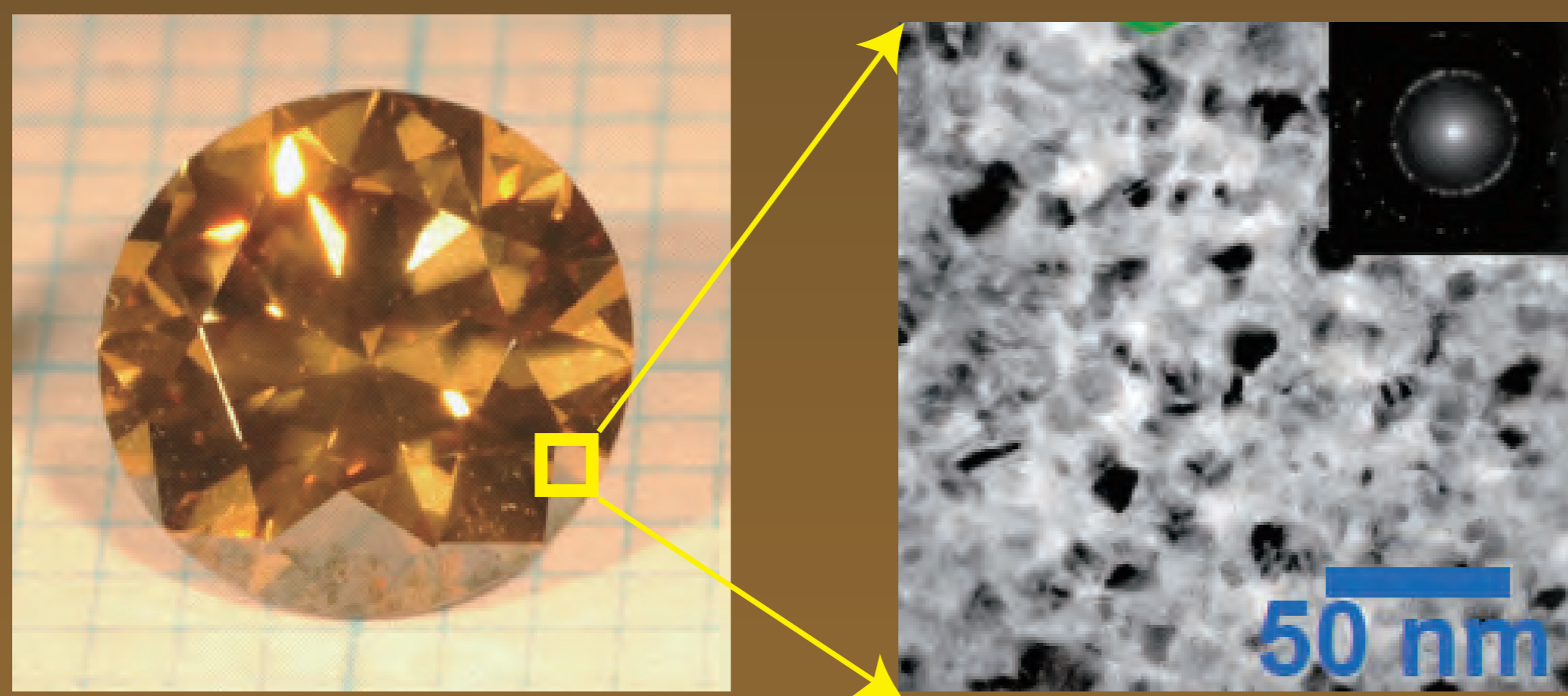
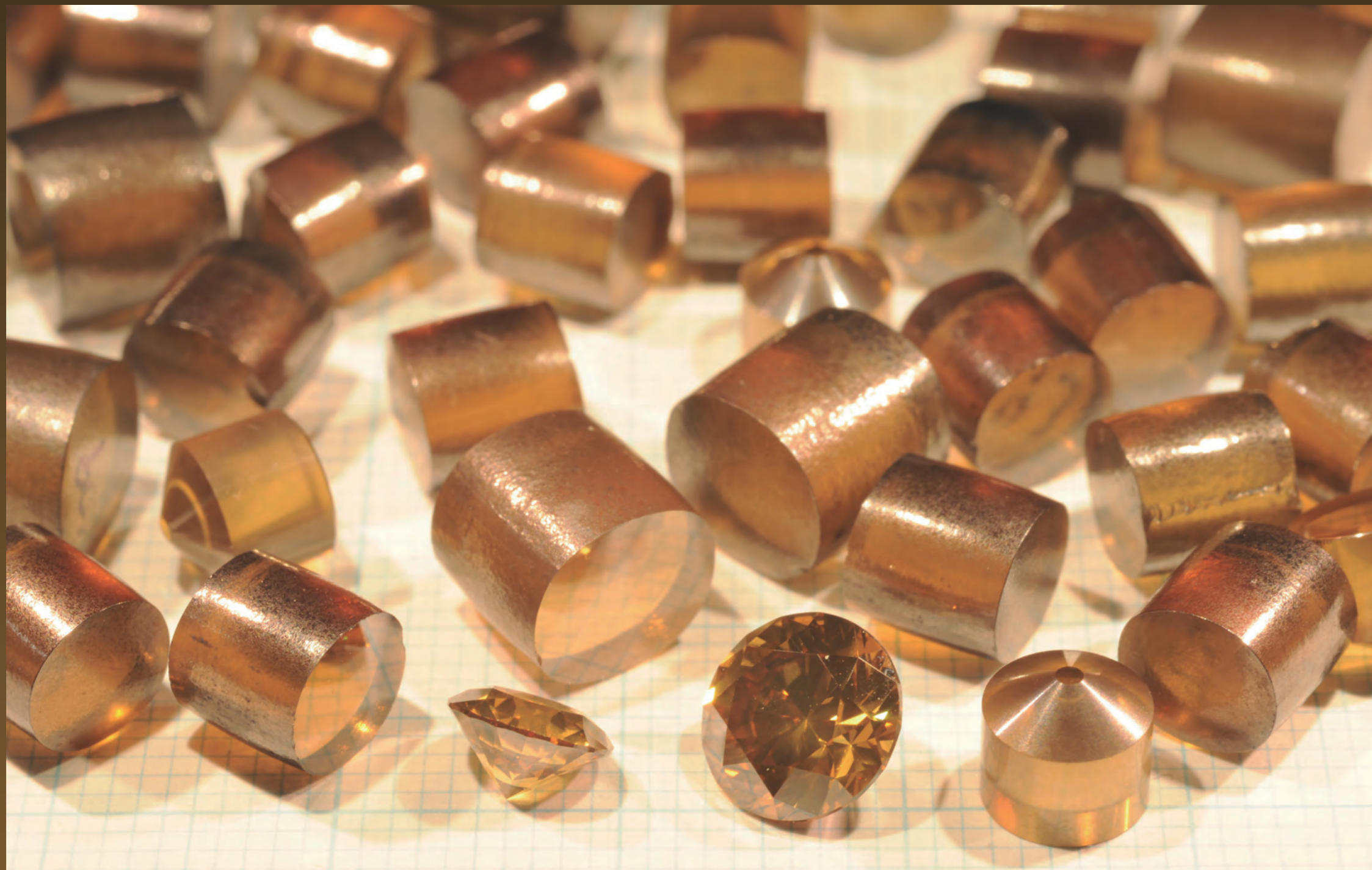


Ultra-hard material HIME-Diamond and creation of novel materials



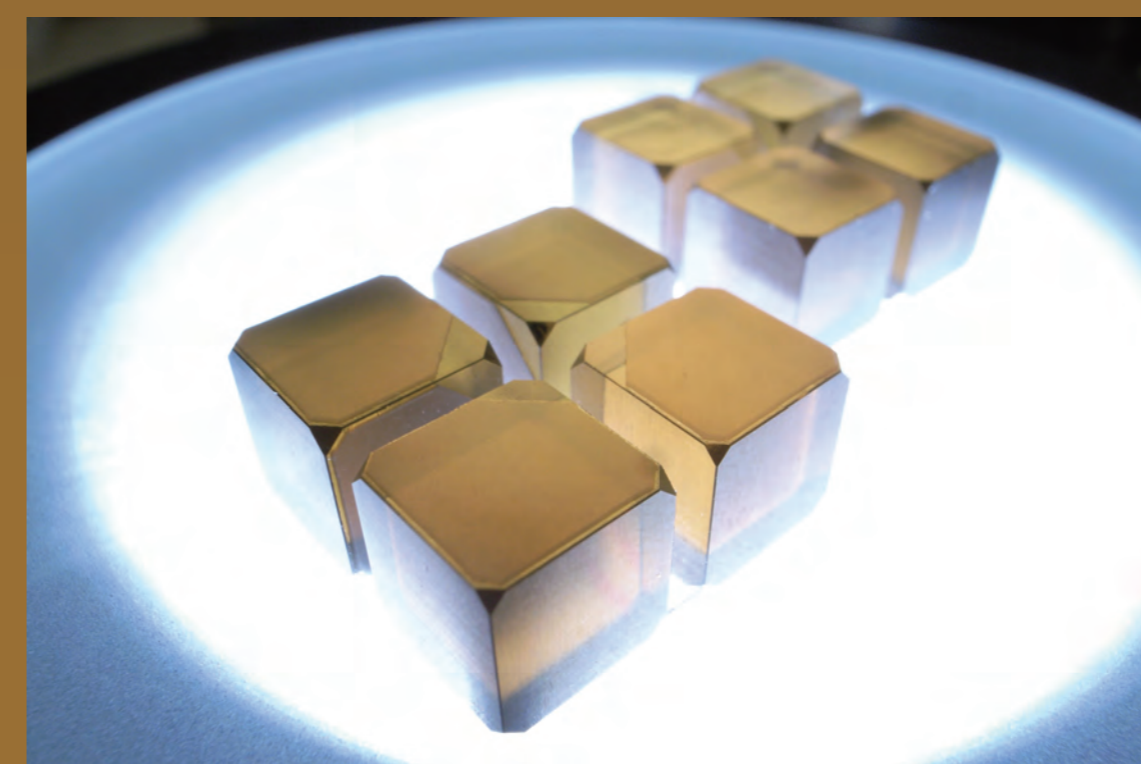
What is HIME-Diamond?



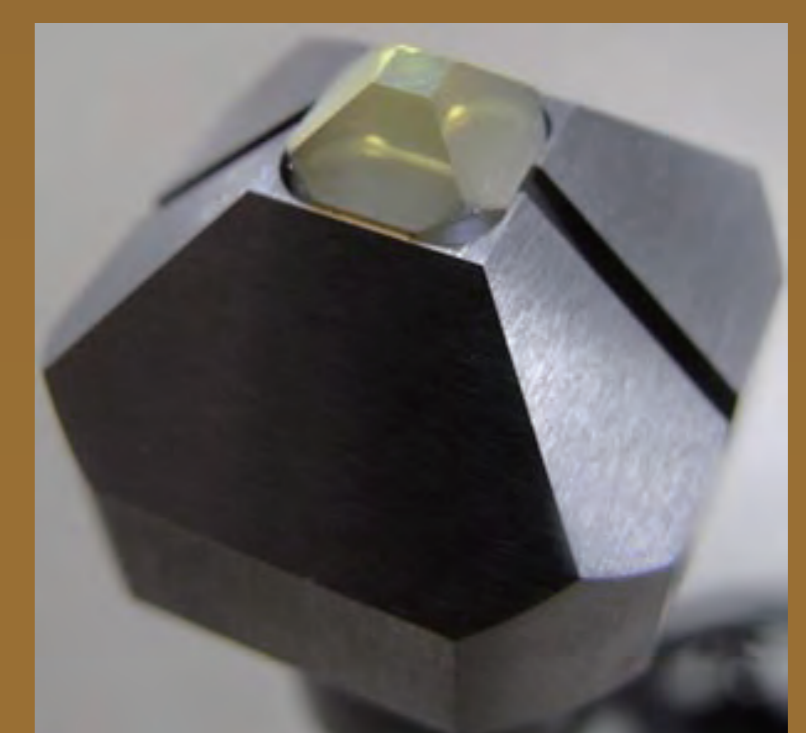
HIME-Diamond synthesized in GRC is the hardest diamond and likely the hardest material in the world. Unlike normal diamond made of a single crystal, HIME-Diamond consists of closely-packed nanometer-sized diamonds (~10 nanometers = one hundred-thousandth millimeters). Thus the HIME-Diamond is also called "Nano-polycrystalline diamond (NPD)".

Toward higher pressure generations

Experiments under higher pressure are of importance to investigate the interiors of the Earth and planets. The harder the compression material is, the higher the pressure we can reach and thus HIME-Diamond plays a major role in future development of experiments at ultrahigh pressure. The high transparency of HIME-Diamond enables high-pressure experiments using optical in-situ observations and synchrotron radiations.



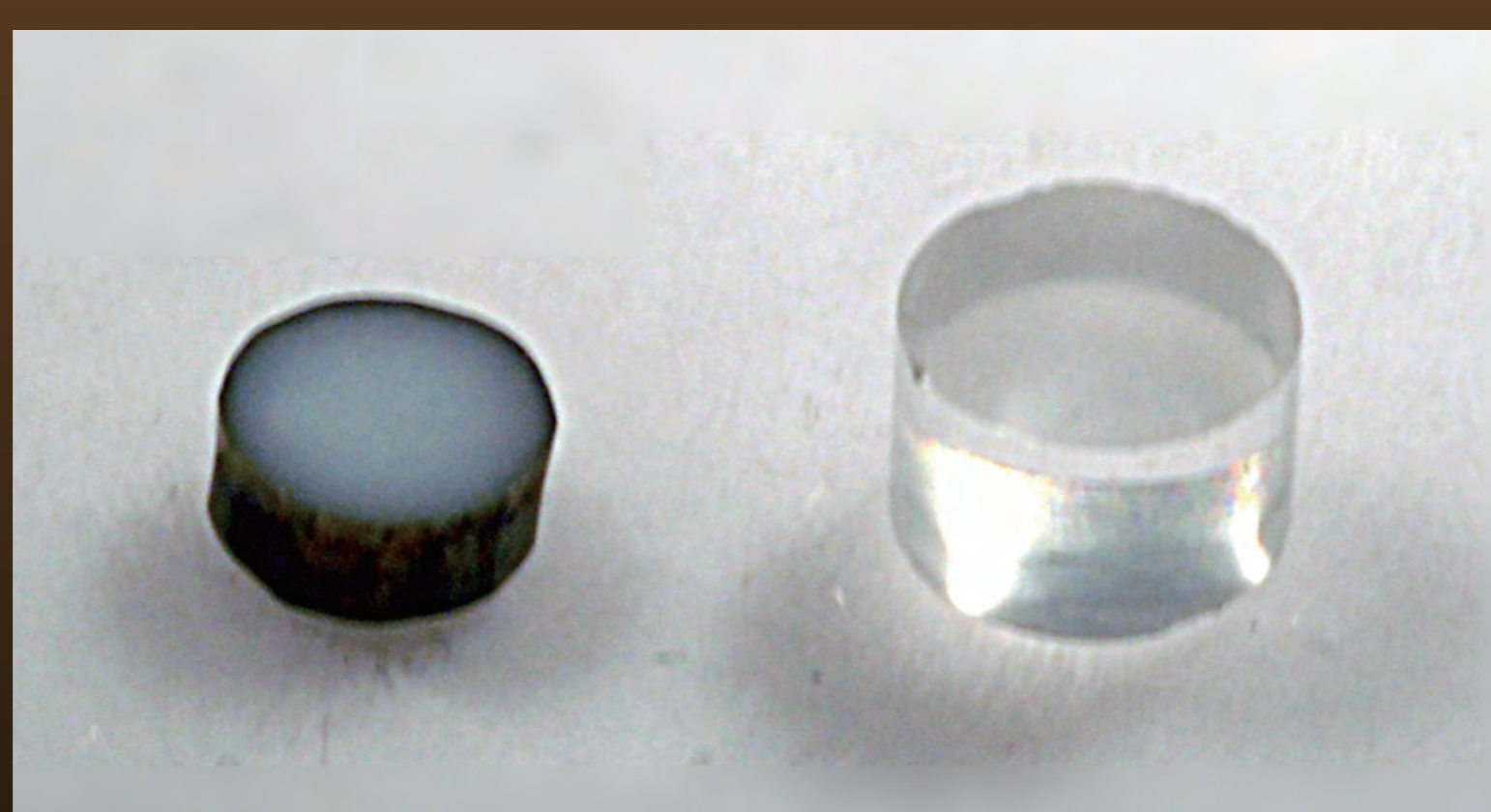
6-8 type multi-anvils



6-6 type multi-anvils

Novel polycrystalline materials and gems

GRC conducts syntheses of novel polycrystalline materials by applying techniques learned from making of HIME-Diamond. Nano-polycrystalline stishovite (NPS) made from silica (SiO_2) is one of the novel materials synthesized by GRC. NPS shows excellent physical properties having both hardness and toughness. Garnets (one of the main constituents within the Earth) with a variety of chemical compositions can be synthesized as nano-polycrystalline materials.



NPS (left) and starting material (glass, right)



Transparent nano-polycrystalline garnets. Purple: pyrope with 5 mol% knorrigite, Green: Grossular with 2 mol% urarovite. These will be applicable not only to sound velocity measurements for mineralogical studies of the Earth's deep interior, but also to functional ceramics such as optical devices.