

The state-of-the-art technology of Oxygen Engineering for the 3rd Generation of Ceramics

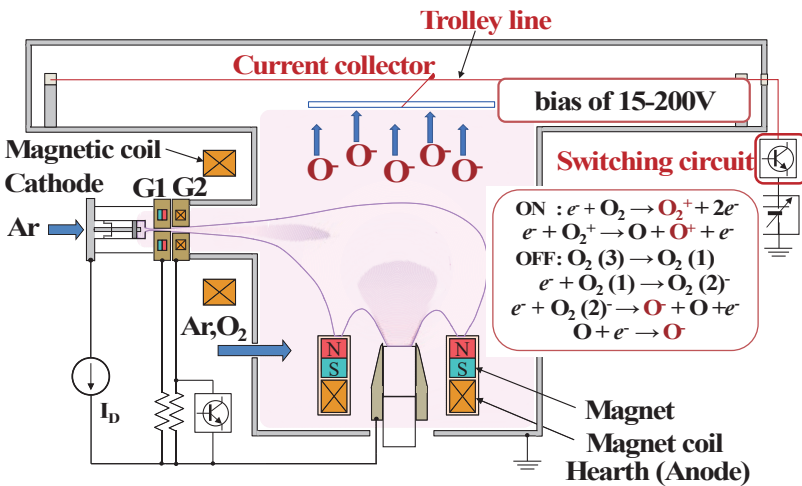
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Electronegative oxygen O⁻ ions: generation & irradiation

Surface and/or bulk oxidation: annihilation of O vacancy, designed reactive oxygen species, tailored native oxides of metals, control of adhesive on interface between oxide films and substrates

mass production line

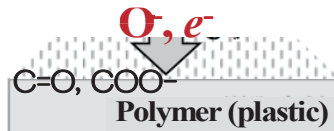
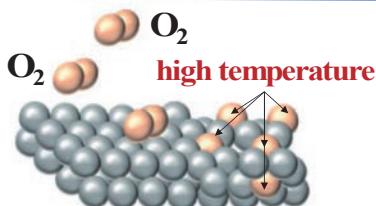


T. Yamamoto, et al., J. Vac. Soc. Japan, 60 (2017) 292.

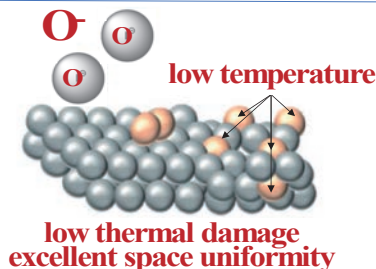
Improvement of adhesiveness and protective surface layer



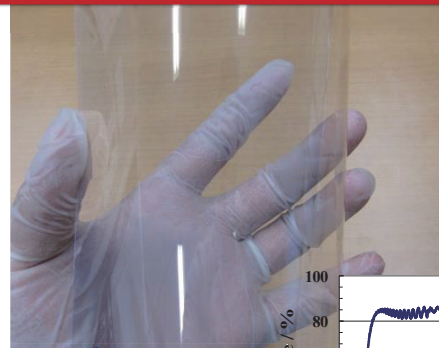
Conventional: roughening treatment, physical



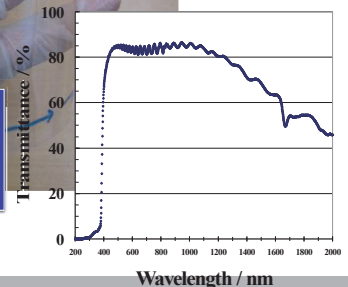
This work: polar-bond treatment, chemical



Improvement: moisture & UV resistance



Advantage: flexible & neutral color with high VIS & NIR T



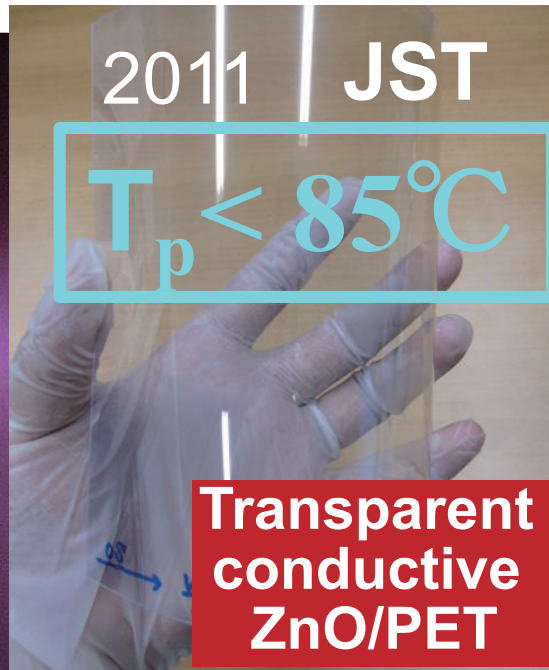
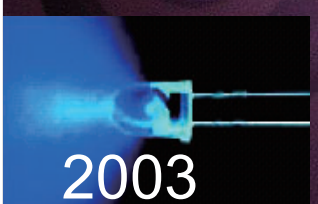
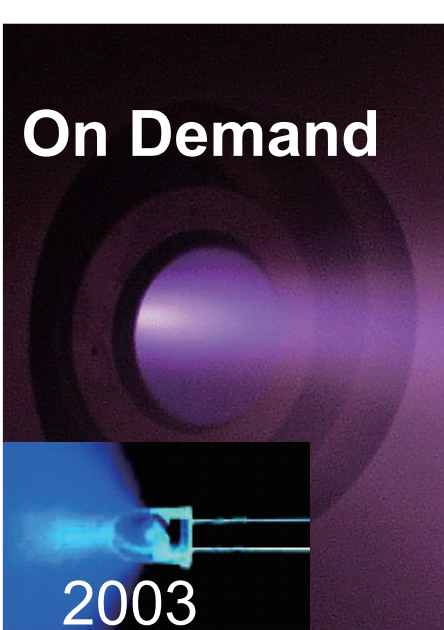
Advanced multi-functional oxide films fabricated by reactive plasma deposition with dc arc discharge

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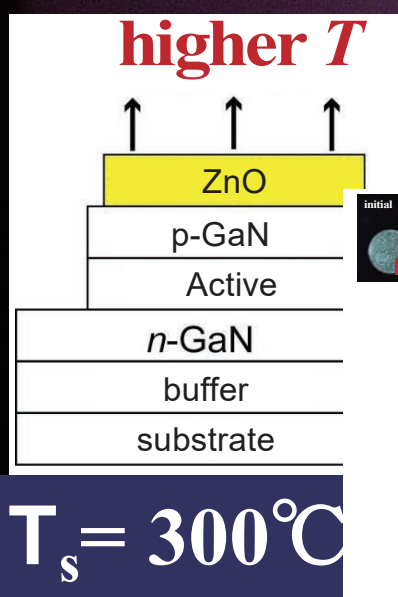
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Applications: Transparent conductive electrodes on glass or flexible polymer substrates, chemical sensors, NIR plasmonic materials, Magnetic-shield films
Antibacteria films on various substrates

On Demand



Hall mobility
145 cm²/Vs



Low temperature, rapid growth

initial	Escherichia (E) coli (大腸菌)	on glass substrate/ ZnO:Ga films	@ 35°C after 24 h	Staphylococcus (S) aureus (黄色ブドウ球菌)	on glass substrate/ ZnO:Ga films	@ 35°C after 24 h
	$9.9 \times 10^9/\text{cm}^2$		< 0.83 , not detected	$1.3 \times 10^9/\text{cm}^2$		< 0.83 , not detected

