

# International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

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## High performance broad band antireflective coatings for optical, solar and display applications

### Overview

The development of broad-band anti-reflective coatings (BARCs) has attracted substantial research interest due to their high transmittance in a broad wavelength range (300–2500 nm) for diverse potential applications spanning photovoltaic systems, solar thermal collectors, optical and architectural glasses, windscreens, high power lasers, windows and video display panels. Due to their high refractive indices, optical elements like glass and polymeric transparent substrates suffer a reflection loss of about 8-9% in the visible spectrum of the solar radiation. Such reflection losses are undesirable and detrimental to the overall light to electricity conversion efficiency. Hence, BARCs that transfer maximum incident light over a broad range of wavelengths can help to achieve competitive conversion efficiencies in solar cells or any other type of devices that require minimal reflection.

### Key Features

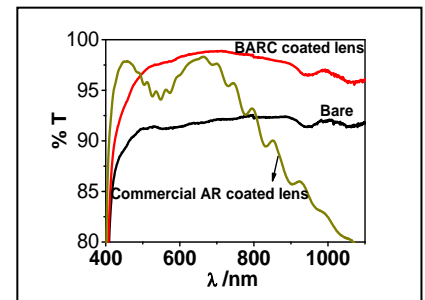
- High transmittances in visible and solar regions: >98 % (in visible) >96% (in solar)
- Low temperature curable (80-100°C)
- High temperature stability: Max up to 1000°C
- Weather stability: > 200hrs withstand in high humidity (>90%) at 50°C
- High mechanical stability and Long durability
- Coat effective coating technique

### Potential Applications

- Solar PV & CSP cover glass
- Optical lenses
- Video display panels
- Architectural glasses
- High power lasers

### Intellectual Property Development Indices (IPDI)

- Performance and stability are validated at laboratory scale
- Scale up of coating, sol preparation and coating development is completed
- Prototype module fabrication & testing are completed



Optical transmittance of BARC coated CR 39 lens compared with bare and commercial antireflective coated lens

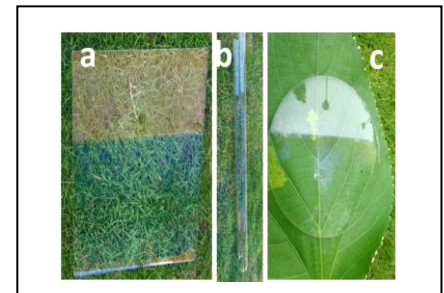


Image of BARC coated PV cover glass (a); CSP cover glass tube (b); CR-39 lens (c)

Status	1	2	3	4	5	6	7	8	9	10

### Major Patents/Publications

1. Indian patent Application no. 4041/DEL/2014, date of filing: 31.12.14.
2. High Performance and Environmentally Stable Broad Band Antireflective Coatings using Novel Ink-Bottle Mesoporous  $MgF_2$  Nanoparticles for Solar Applications, Solar Energy Materials & Solar Cells 159 (2017) 204–211.

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