High-albedo C-type asteroids in the outer main belt: AKARI and Subaru observations

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*High-albedo C-complex Asteroids in the Outer Main Belt: The Near-infrared Spectra*

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High-albedo C-type asteroids in the outer main belt

- Most C-type asteroids are considered as low albedo dark objects and are associated with carbonaceous chondrites (Chapman+ 1975).

- Recently high-albedo C-type asteroids were identified with the infrared astronomical satellite AKARI.

- Ice or frost may exist on surface of C- or D-type asteroids in the outer main belt (Campins+ 2010; Rivkin&Emery 2010; Licandro+2011; Fernández+ 2009).

- There is no NIR spectroscopic survey for water ice on high-albedo C-type asteroids.
Observations with the Subaru Telescope (2012/02/16 UT)

- IRCS + AO188 (asteroids as NGS), non-sidereal tracking
- 52mas, JH + HK grism spectroscopy, slit = 0.9 arcsec (\(\lambda/\Delta\lambda \sim 130\))
- exposure : 120 sec \(\times\) 4 -- 180 sec \(\times\) 8

<table>
<thead>
<tr>
<th></th>
<th>(a) [AU]</th>
<th>(e)</th>
<th>(i) [deg]</th>
<th>(d) [km]</th>
<th>(p_v)</th>
<th>type</th>
<th>(r_H) [AU]</th>
<th>(V_{mag})</th>
</tr>
</thead>
<tbody>
<tr>
<td>(723) Hammonia</td>
<td>2.995</td>
<td>0.054</td>
<td>4.99</td>
<td>28 (\pm)1</td>
<td>0.29 (\pm) 0.03</td>
<td>C</td>
<td>3.088</td>
<td>14.68</td>
</tr>
<tr>
<td>(936) Kunigunde</td>
<td>3.131</td>
<td>0.178</td>
<td>2.37</td>
<td>38 (\pm)1</td>
<td>0.12 (\pm) 0.01</td>
<td>B</td>
<td>3.682</td>
<td>15.19</td>
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<tr>
<td>(1276) Ucclia</td>
<td>3.177</td>
<td>0.095</td>
<td>23.28</td>
<td>30 (\pm)1</td>
<td>0.14 (\pm) 0.01</td>
<td>C</td>
<td>2.935</td>
<td>14.92</td>
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<tr>
<td>(1576) Fabiola</td>
<td>3.146</td>
<td>0.168</td>
<td>0.95</td>
<td>26 (\pm)2</td>
<td>0.10 (\pm) 0.02</td>
<td>B</td>
<td>3.548</td>
<td>16.97</td>
</tr>
</tbody>
</table>

(as of 2012/02/16 )
Results

(723) Hammonia

(936) Kunigunde

(1276) Ucclia

(1576) Fabiola
Fitting with intimate mixture model

(723) Hammonia

- H₂O: 0%, AC: 48%, Apyx: 48% (Mg:Fe = 70:30),
- grain size = 40 μm, χ² = 0.688

(936) Kunigunde

- H₂O: 0%, AC: 6%, Apyx: 94% (Mg:Fe = 95:5),
- grain size = 6 μm, χ² = 3.201

(1276) Ucclia

- H₂O: 0%, AC: 0%, Apyx: 100% (Mg:Fe = 60:40),
- grain size = 200 μm, χ² = 0.503

(1576) Fabiola

- H₂O: 0%, AC: 61%, Apyx: 39% (Mg:Fe = 80:20),
- grain size = 6 μm, χ² = 1.485
Summary

We carried out NIR spectroscopic observations for high-albedo C-type asteroids using Subaru/IRCS+AO188 to investigate the compositions of these objects.

- Water ice absorption features near 1.5 and 2.0 $\mu$m were not detected in our four targets.

- Featureless or possible weak broad absorption band of these asteroids can be reproduced by Mg-rich (60 -- 95%) amorphous pyroxenes (or, crystalline silicates).
  - The results imply that Mg-rich silicates are responsible for high albedo of these C-type asteroids (c.f., Emery&Brown 2004; Lucey&Noble 2008).