INTRODUCTION
The design and construction of metal-organic coordination poly-
mer is an interesting research field due to the fascinating structural
diversity of these compounds and to their potential applications in
nonlinear optical and fluorescent materials3,4, as well as several other
different fields such as luminescence, catalysis, gas storage, molecu-
lar adsorption, magnetic materials, ion exchanges and zeolite-like
materials1. Self-assembly of these complexes can be realized by se-
lection of proper organic ligands and there is a lot of interest in the
search for new bridging ligands, which could give desired properties
to newly synthesized materials. In particular, new magnetic materi-
als, due to its role as a short bis(chelating) ligand. On the other
hand the auxiliary ligands containing nitrogen donors such as bipyri-
dine have been extensively employed in

EXPERIMENTAL
2.1 Synthesis
A mixture containing Mn(ClO4)2. 6H2O (60mg, 0.25mmol),
CH2(COOEt)2 (63mg, 0.13mmol) and dipy (15mg, 0.10mmol) was dis-
olved in 20% ethanolic solution (12ml). The mixture was refluxed for
two hours, and then transferred to a small vial by filtration. The pris-
matic yellow crystals with suitable size for analysis appeared within
two days. The complex is stable in air and insoluble in all common
solvents.

2.2 Crystal structure determination and refinement of
the title complex
Suitable yellow prismatic single crystals of the title complex were ob-
tained by slow evaporation of the solvent at room temperature within
two days. X-ray single-crystal diffraction were calculated on aXcali-
bus, Onyx diffractometer at 120 k, Cu kα radiation (λ = 1.54180)
used and a multi-scan correction for absorption were used. The
structure was solved by direct methods and refined on F2 by full-ma-
trix least-squares(SHELEX97)14, and WingX15. Crystal data, data col-
lection and structure refinement details are summarized in (Table
1).

Crystal data.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C12H8MnN2O4</td>
<td></td>
</tr>
<tr>
<td>Wavelength</td>
<td>1.54180Å</td>
</tr>
<tr>
<td>Temperature</td>
<td>120 K</td>
</tr>
<tr>
<td>Formula weight</td>
<td>299.14</td>
</tr>
<tr>
<td>Crystal system</td>
<td>orthorhombic</td>
</tr>
<tr>
<td>Space group</td>
<td>Pna21</td>
</tr>
<tr>
<td>Unit cell parameters</td>
<td>a = 13.7452(4)Å, b = 13.4752(4)Å, c = 3.50019, sexto F, no Florence, Italy</td>
</tr>
</tbody>
</table>

The new coordination polymer[Mn 2(C12H8N2O4)4]n takes the form of one dimensional zigzag chain built of Mn(II) cations linked by oxalate dianions. The oxalate anion coordinated as a bridging tetradentate ligand with bidentate coordination of individual oxygen atoms. The Mn(II) cation has a highly distorted octahedral geometry formed by four oxygen atoms from two bidentate oxalate anions and two nitrogen atoms from one chelating 2,2-bipyridine (bipy) ligand. The zigzag chain which run along the a-axes, further construct a three-dimensional metal-organic framework via π-stacking and C-H•••O hydrogen bonds.

KEYWORDS : One dimension; Oxalate; Zigzag ;MnII; Bipyridine.

*Corresponding author:E-mail: Elmahdawi@yahoo.com;
RESULTS AND DISCUSSION

A new one-dimensional coordination polymer with mixed bipy and oxalate ligands [Mn(bipy)(ox)]n (1) scheme 1 was synthesized by refluxing a mixture of Mn(ClO₄)₂·3H₂O, malonate and bipy involving in situ formation of oxalate ligand. In this context the in situ formation of oxalate dianion from the reaction of malonate dianion, bipy and Mn(ClO₄)₂, bears some resemblance to the in situ formation of oxalate and pyrimidine-2-carboxylate reported by Jian-Yong et al.13, where 2-cyanopyrimidine and MnCl₂ were used as starting materials. The transformation of malonate dianion might proceed through a pathway similar to that reported by Jian-Yong, scheme 2. The asymmetric unit of (1) contains one Mn(II) atom, one oxalate dianion and one dipy ligand. Each Mn(II) atom is six coordinate in a highly distorted octahedral by four oxalate oxygen atoms from two different oxalate anions and two nitrogen atoms from one dipy ligand with Mn-N₂O₄ chromophore forming a (4+2) coordination polyhedron (Figure 1).

The two oxygen O (O₂,O₄) atoms from two different oxalate groups and two nitrogen N (N₁,N₂) atoms of the bipy ligand are coplanar and define the equatorial plane of the octahedron (max deviation from the mean plane 0.162 (6)Å for N1,Mn1 only 0.010 (1) Å apart from this plane), which is significantly distorted due to small bite angles 76.8 (2°), 76.6 (2°) and 73.4(2°) of the oxalate groups and the bipy ligand respectively. Two oxygen O (O1,O3) atoms from two oxalate groups already involved in coordination to the equatorial plane occupy the axial positions of the octahedron. The Mn(II) center is coordinated by two different types of ligands, which both behave as chelating ligand [Mn–O = 2.155(5)Å, 2.178(5)Å, 2.157(5)Å, 2.169(5)Å for O1, O2, O3, and O4 and Mn–N = 2.251(6)Å and 2.39(6)Å for N1 and N2 respectively] (Table 2).

The coordinated bipy units are parallel to each other and protrude towards opposite directions (the angle between the two mean plane is 2°), so that off-set n-stacking contacts, with inter-planar distance of 3.973(5)Å and 3.965(5)Å, respectively, and ring centroid-ring centroid distance of 4.219(7)Å, are established between the bipy units of adjacent chains (Figure 2).

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Table 2

<table>
<thead>
<tr>
<th>Bond lengths (Å)</th>
<th>Bond angles (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mn1–O1</td>
<td>2.155(5)</td>
</tr>
<tr>
<td>Mn1–O2</td>
<td>2.178(5)</td>
</tr>
<tr>
<td>Mn1–O3</td>
<td>2.157(5)</td>
</tr>
<tr>
<td>Mn1–O4</td>
<td>2.169(5)</td>
</tr>
<tr>
<td>Mn1–N1</td>
<td>2.251(6)</td>
</tr>
<tr>
<td>Mn1–N2</td>
<td>2.39(6)</td>
</tr>
</tbody>
</table>

Symmetry codes: (i) x+0.5, -y+0.5, z; (ii) x-0.5, -y+0.5,z.
Interactions.

As a result, a 2D network based on both coordination bonds and weak interactions is obtained. The crystal packing is then completed by the action of the two-fold screw axis running along the c axis, which repeats the 2D network, in a parallel plane lying 6.873(2)Å apart (Figure 3).

Fig.3. 2D networks repeated along the c-axis

Further analysis of the packing structure reveals that the parallel 2D networks interact through C–H—O hydrogen bonds (C9–H9—O4 = 2.390(5)Å, C9—O4 3.276(9)Å) which contribute to sustain the overall assembly of the title compound (Figure 4).

Fig.4. Top view of the 2D networks repeated along the c-axes and CH...O interactions.

REFERENCES